VOL. XXX NEW YORK—THURSDAY, APRIL 9, 1914—CHICAGO No. 15.

One of the Panhard tractors with trailer negotiating a difficult stretch in the cross country test

Tractors 100% Efficient

All Entrants in French Army's Severe Tests Finish in Good Condition—No Outside Assistance Used

By W. F. Bradley

PARIS, March 25—Thirteen four-wheel-drive tractors left the city of Rheims for a 600-mile test over the hills and rough roads along the Eastern frontier, and thirteen tractors with their two trailers each have reported in good condition.

This test has been the most severe to which motor vehicles have ever been subjected. It is the first time they have operated in hills and over dirt roads in mid-winter. So severe was the test that drivers were kept on duty for periods of 24 and 36 hours. The men were utterly exhausted, but the machines made good.

Two weeks ago we described the four makes of four-wheel-drive tractors which have been tested out by the French army and last week a description of the test was given. This week more details are given and some conclusions drawn. The superiority of the motor-driven vehicle as compared with wagons hauled by horses, for army work, was conclusively proven. Whatever small misgivings the French army authorities had concerning the adaptability of the gasoline-propelled machines was entirely removed by the splendid performances of the tractors and trailers.

Features of Tractor Test

Two types tested.....light and heavy
Total weight.....13.5 to 22.5 tons
Fuel.....1.3 to 3 miles per gallon
Minimum clearance.....12 inches
Maximum grade climbed.....22 per cent.
Winches used for pulling out of mud.

The trials just completed tested the machines to the utmost and they made good. With the course over the poorest roads in France, through a section noted for its steep hills and soft, muddy dirt roads, all thirteen cars came through without any serious mechanical trouble and without the least outside assistance.

Many times the machines were mired right up to the axles and yet they pulled out under their own power with the aid of their capstans and non-skid devices. Hills were negotiated that were so steep that any number of horses could not have hauled up the trailers which in many cases weighed as much as 7.5 tons. Some of the hills climbed were so precipitous that the brakes of the trailers were not strong enough to hold them and with the exception of one tractor, two sets of brakes were required to hold the tractors.

On a ton-mile basis the fuel consumption was remarkably good, some of the trains doing better than 40 miles to the gallon. The average consumption on the light tractors and trailers was 3 miles to the gallon, while the heavy trains con-

Left—Renault tractor climbing a 22 per cent. grade test hill. Upper right—Big Panhard hauling one trailer up hill. Lower right—Schneider making use of steel running board in cross country test

sumed a gallon of gasoline in traversing from 1.3 to 2.2 miles.

While the test showed the worth of these vehicles and although no real mechanical trouble developed, some little difficulty was experienced with tires, non-skid chains, and brakes.

The chains were the cause of the excessive wear on the tires, the chains often breaking and cutting the tires so that in many cases the tires were worn down to the rims.

Two Types Tested

Brakes were hardly adequate. On a 22 per cent. grade the Schneider was the only tractor that was able to stand still with only one set of brakes applied, and even where both sets were used there was trouble in holding the tractors after they had started to back down.

Two types of tractors were tested, known respectively as light and heavy, towing weights of 8 and 10 tons minimum. The heavy tractors weighed 5.5 tons and carried a useful load of 2 tons, making a total weight of 22.5 tons for the tractor and two trailers fully loaded. In the light class, the tractor weight was 3.5 tons maximum with a useful load of 2 tons, and a weight of 8 tons for the two trailers, making a total of 13.5 tons for the three units fully loaded.

It was required that the load be equally distributed over the vehicle and no axle was allowed to carry more than 4 5 tons. A minimum clearance of 12 inches was required with the vehicle loaded. Platform bodies with removable sides were specified on both the tractors and trailers in order to secure flexibility of arrangement.

Four-Cylinder Motors Obligatory

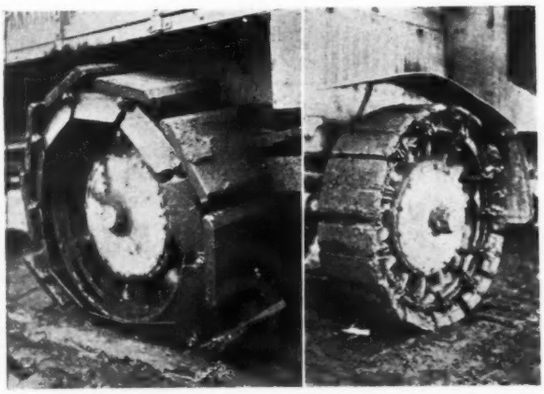
A certain latitude in the general design was allowed but four-cylinder motors were obligatory, and restrictions were made regarding the interchangeability of parts and particularly of magnetos. The carbureter had to be capable of running with alcohol, benzol or gasoline. The cooling systems had to be large enough to allow operating the motor at full load for 30 minutes while the vehicle was immobile.

A winch or capstan was required together with the necessary amount of cable, and besides a flexible coupling at the rear and towing hooks both front and rear.

Solid twin rubber tires were obligatory on all four wheels and provision had to be made for attaching chains or other anti-skid devices.

The tire widths specified for different weights were as follows: 4.3 inches, 1,980 pounds; 4.7 inches, 2,310 pounds; 5.1 inches, 2,645 pounds; 5.5 inches, 2,970 pounds, and 6.29 inches, 3,740 pounds.

Fuel consumption, strength, and accessibility of the various parts, ratio of useful load to total weight, speed and ease of operation, and particularly the ability to work under difficult conditions away from made roads will be the factors taken into consideration when making the awards.



Left—Panhard wheel with bracelet for mud plugging. Right—Panhard wheel equipped with blocks

Army Will Adopt Tractors

As the result of these trials there will be a large increase in the number of four-wheel-drive tractors employed in the French army, and particularly in the artillery corps. The superior officers were already so convinced of the utility of these vehicles that they had placed big orders, but they lacked accurate data on the range of usefulness under war conditions when the roads and the country are in their heaviest possible condition. Un-

like motor trucks, artillery tractors rarely have the privilege of traveling over well-made roads. The necessity of securing commanding positions makes it imperative that they should be capable of traveling across country anywhere a horse team can move a load, and even where it cannot.

This competition is decidedly remarkable by reason of the lack of mechanical defects and breakdowns. A few repairs had to be carried out, but they were always of such a nature that they could be attended to by the crew, and it was never because of mechanical defects that the machines failed to report in on schedule time. Now that they have returned to Paris, each tractor will be stripped to the ground and the parts examined by a technical committee. This operation is carried out in private, only the jury and the interested manufacturer being present. No communication will be made to the public; yet it is evident that there cannot be any serious wear, for the tractors were given the most difficult tasks on returning to Paris and accomplished them with comparative ease.

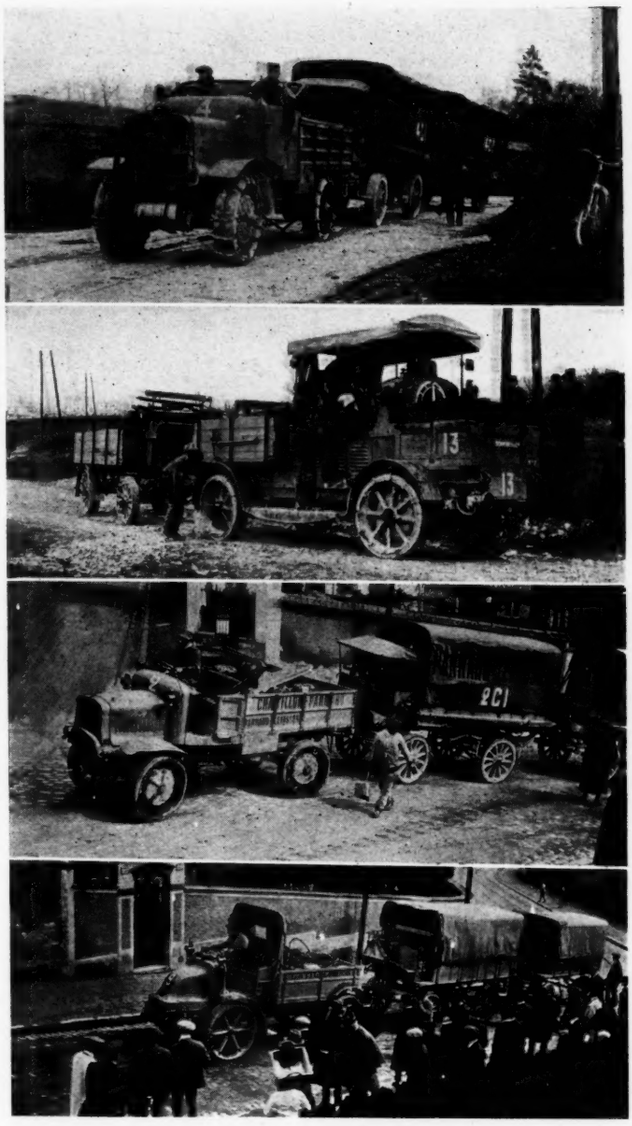
Narrow Roads Caused Blocks

More criticism can be levied against the committee responsible for the trials than against the tractors taking part in them. It was shown that it was a mistake to send a series of trains, each one consisting of three vehicles and weighing from 14 to 23 tons, over dirt roads so narrow that passing was a difficult matter. It happened on several occasions that a trailer would become embedded in the soft mud by the roadside and hold up all those in the rear. As no tractor ever gave help to its companion, it happened on more than one occasion that the leaders would check in before night and the tailenders would not report home until 6 or 8 o'clock the next morning. This delay was in no way caused by mechanical difficulties.

It should be noted that outside help was never secured on any occasion. Wagons weighing 7 1-2 tons would become embedded in mud until their frame members were touching the ground; the tractor itself sank until its mechanical organs were touching mother earth, but in every case they were got clear under their own power. All the material necessary for getting free was carried on the vehicles. The quantity was unnecessarily large, but this being the first contest of its kind a considerable amount of experiment had to be indulged in, and much of the material would be eliminated from future competitions.

Hill-Climbing Ability Tested

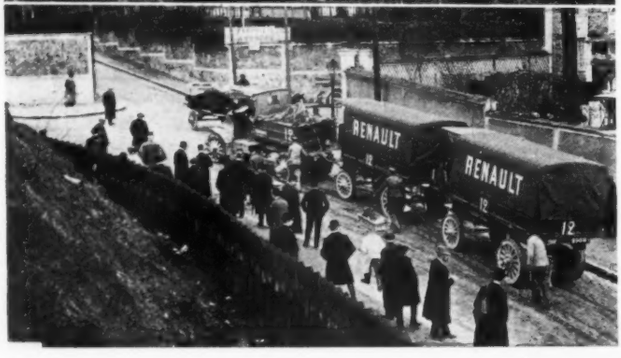
On returning to Paris it was decided by the military jury



Top—Big Panhard hauling two trailers. Upper middle—Schneider on greasy grading. Lower middle—Light Panhard with Knight motor on an 11 per cent. hill. Bottom—Light Latil tractor

Mechanical Specifications of Eleven Tractors in French Army Tests

Tractor	Bore and Stroke, Inches	Cylinders Cast	No. of Speeds	No. of Differentials	Weight of Tractor, Pounds	Weight of Tractor, Loaded	Useful Load on Tractor	Weight, Towed, Pounds	Total Weight, Tons	Extra Weight on Rear Axle	Tire Widths, Inches	Wheel Diameters
1. Panhard-Chatillon (Knight)	3.9x5.5	Singly	8	1	10,582	12,125	1543	18,959	15.5	1-4	4.7	39.3
2. Panhard-Chatillon (Knight)	3.9x5.5	Singly	8	1	10,582	12,125	1543	22,046	15.5	1-4	4.7	39.3
3. Panhard-Chatillon	4.9x5.9	Singly	4	1	12,125	15,983	3857	33,069	22.2	1-3	4.7	39.3
4. Panhard-Chatillon	4.9x5.9	Singly	4	1	12,125	15,983	3857	33,069	22.2	1-3	4.7	39.3
7. Latil	4.7x6.2	Block	5	2	11,464	15,762	4409	33,060	22.2	Equal	4.3	44.8
8. Latil	4.7x6.2	Block	5	2	11,464	15,762	4409	33,060	22.2	Equal	4.3	44.8
9. Latil	3.7x5.5	Block	5	2	9,479	12,125	2645	18,408	14	Equal	4.3	44.8
11. Renault	5.1x6.2	Pairs	4	2	12,455	16,534	4078	34,610	23.2	1-4	5.5	39.3
12. Renault	5.1x6.2	Pairs	4	2	12,455	16,534	4078	34,610	23.2	1-4	5.5	39.3
13. Schneider	4.9x5.5	Singly	4	2	13,007	16,534	3527	33,069	22.5	Equal	4.7	39.3
14. Schneider	4.9x5.5	Singly	4	2	13,007	16,534	3527	33,069	22.5	Equal	4.7	39.3



Top—One of the Latil tractors with its trailer negotiating a rough bit of country road. Note the way tires are bound to obtain traction. Upper middle—Schneider using steel running board on cross country test to cross a narrow ditch. Lower middle—Latil tractor just after having extricated itself from some soft ground. Note the mud clinging to the outline of the wheels. Bottom—Renault of a total weight of more than 23 tons climbing the 11 per cent. grade in a hill climbing test

These four pictures indicate in a conclusive manner the ability of these machines to surmount the difficulties offered by the soft roads and hilly country

Latil tractor beginning the climb up a 22 per cent. test hill

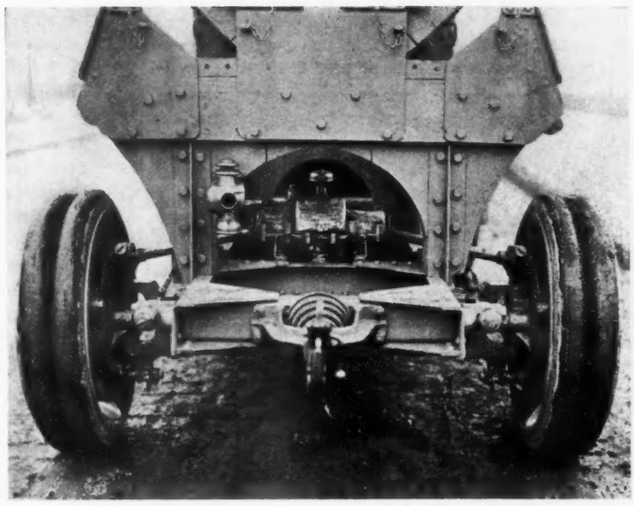
to carry out a series of supplementary tests dealing with hill-climbing ability, the use of winches and capstans, brakes, and the power of operating across country with thick mud prevailing. The first tests were the climbing of a gradient of 11 per cent. with an S turn in the middle. Tractors had to get half way up with two trailers, then unhitch the trailers for a brake test, and finally haul the trailers to the top by means of the capstan. The results of the trailer brake test were uniformly unsatisfactory. When the 15-ton loads were left to themselves it was impossible to hold them on the hill with their own brakes. These brakes were of the ordinary horse wagon type, brought into contact with the steel rim of the wheel by a screw or by a lever. In every case the diameter of the shoes was too small.

There were two distinct types of hauling appliances: vertical worm-driven capstans at the rear of the tractor, and worm-driven winches set across the front of the tractor and between the two frame members. This type of winch, making use of a steel cable, was found on the heavy Panhards. A second and similar Panhard had the same type of winch, but on the request of the jury it had been transformed to be used as a horizontal capstan. The most rapid work was done by the Panhard with the winch and steel cable. This required the smallest number of helpers, could be got into action in the shortest possible time, and allowed advantage to be taken of the full weight of the vehicle. The same type of machine with horizontal capstan was much longer in getting into action and called for a greater number of men to attend to the rope.

Tractors Locked When Working Capstan

Methods of locking the tractors when hauling with the capstan were important. On the Latils use was made of two stout struts pivoted to the rear of the frame members. These struts had pointed ends and a circuar disk just above the point, in order to prevent sinking too far into soft ground. When working on a hill the difficulty was to prevent the whole of the weight being taken off the rear of the tractor. The capstan worked well, but if the front wheels had not been well blocked, the entire vehicle would have jumped its sprag.

All vehicles were called upon to climb this hill with full load. The importance of road conditions was clearly demonstrated here. One of the heavy Panhards, making the first attempt, fitted chains round its tires, but when it got on the greasy granite blocks it was impossible to move. The wheels spun round, digging the road away and also scattering the chains, but in half an hour the tractor had not moved more



Rear view of Latil four-wheel drive tractor

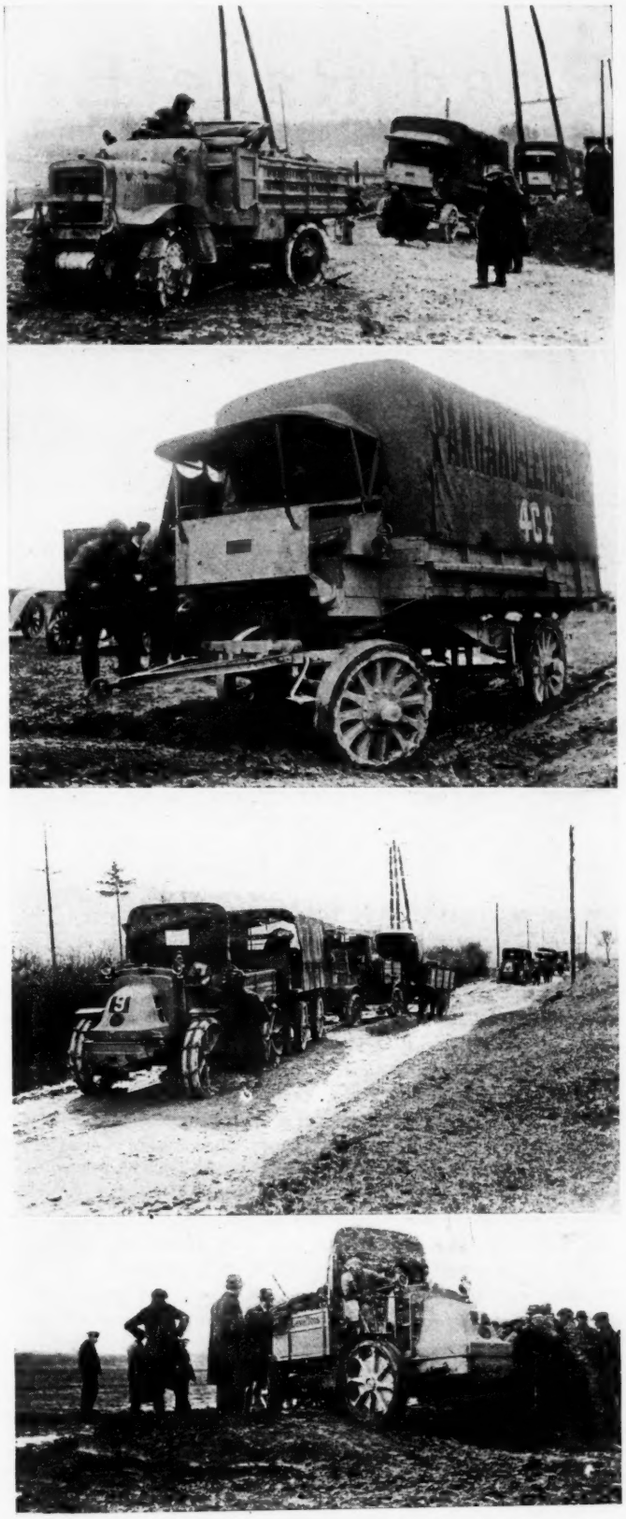
than a few inches. In the meantime the road dried a little and the whole of the following tractors went up the hill with or without chains. The Panhards made a second attempt later, without chains, and climbed the hill easily at 4 miles an hour.

22 Per Cent. Grade Climbed

The supreme hill climb was on a 22 per cent. gradient with a right-angle turn at the bottom. This had to be climbed by the tractors only with full load on their platforms. All the tractors went up with comparative ease. Each tractor was stopped in the middle for brake tests. In every case it was possible to hold the tractors with two sets of brakes, but in some cases it was difficult to stop them when they were allowed to run backwards. The Schneiders, with external wood block brakes were the only ones capable of stopping with a single set of brakes. This climb was most conclusive. Although the attempt was not made, it was evident that the tractors could have hauled their trailers up singly by the use of the capstan. It would have been impossible, with any number of horses, to get a 7 1-2 ton dead weight up this hill.

Cross-country tests were made on a military ground near Paris, where nearly a month's persistent rain had made conditions as difficult as they could possibly be. These trials had particularly in view the efficacy of the various paddles and other appliances for worming a way through mud. The Latils and No. 4 Panhard had a steel rim with deep projecting ribs, which was bolted on to the side of each wheel. Another Panhard made use of hard wood strips placed across the wheel at very frequent intervals and attached by chains going between the spokes. Another Panhard device consisted of a ring of metal plates forming links and completely covering the rubber tires. An almost square hard wood block was pivoted to each of these links, forming a series of wood paddles around the wheel. Schneider had a pair of steel running boards which could be quickly taken off and made use of to get over ditches and soft places. Most of the Schneider work was done with heavy chains round the wheels, and the use of the running boards for the bad spots.

Tires suffered most severely in these trials. There were frequent cases of chains breaking, particularly when trying to get away from granite blocks coated with grease. In these cases the loose portions of the chains became embedded in the rubber and caused huge chunks to be broken off. The wear was altogether uneven. While one tire would be in very satisfactory condition, a companion one would be cut away to the steel rim.



Top—Big Panhard hauling trailers by means of capstan. This was occasionally necessary in the course of the tests. Upper middle—An instance of the way the trailers sometimes sank in the mud. The example shown is one of the Panhard trailers. Lower middle—Latil and Schneider tractors stopped on a hill. The wheels are blocked to prevent the heavy vehicles from rolling backwards. Bottom—One of the Latils on a cross country test. The tests were so severe that drivers were kept on duty for periods of 24 and 36 hours. The men were utterly exhausted but the machines made good, demonstrating the great superiority of the four-wheel-drive tractor with trailers, for the severe requirements of active service in the army

Road Race Ends French Tour

Thirteen Have Clean Scores —Buick Only Team to Finish with Perfect Record—Pierron Wins Speed Trial

Pierron car which finished Tour de France and won the road race at Le Mans

Cars Finishing Tour de France with a Clean Score

CAR	(BORE AND STROKE (MM)	TIME
Pierron	80 by 150	1:08:40
Gregoire	70 by 140	1:21:35
Buick	95 by 95	1:26:14
Phoenix	67 by 140	1:26:35
Barre	80 by 150	1:35:42
Bugatti	68 by 100	1:36:13
Buick	95 by 95	1:38:07
Zedel	74 by 120	1:38:25
Hispano-Suiza	80 by 130	1:42:09
Georges Roy	80 by 120	1:42:12
Aquila-Italiana	80 by 130	2:00:56
Barre	80 by 150	2:04:46
Aquila-Italiana	80 by 130	2:05:06

PARIS, March 26—Two Buicks with clean scores were among the thirteen cars which today finished the 3,000-mile reliability tour around France which started with thirty-three cars on March 2. This tour, the third of its kind, was for cars limited to 183 cubic inches piston displacement, and required that they should average 19 miles per hour throughout the run and travel from 200 to 280 miles per day according to the different stages of the route.

Previous to the start of the run all essential parts of the cars were sealed and the breaking of a seal disqualified the car, the car also being disqualified if it failed to average 19 miles per hour in every stage of the run. A pace-making car preceded the contestants to prevent speeding.

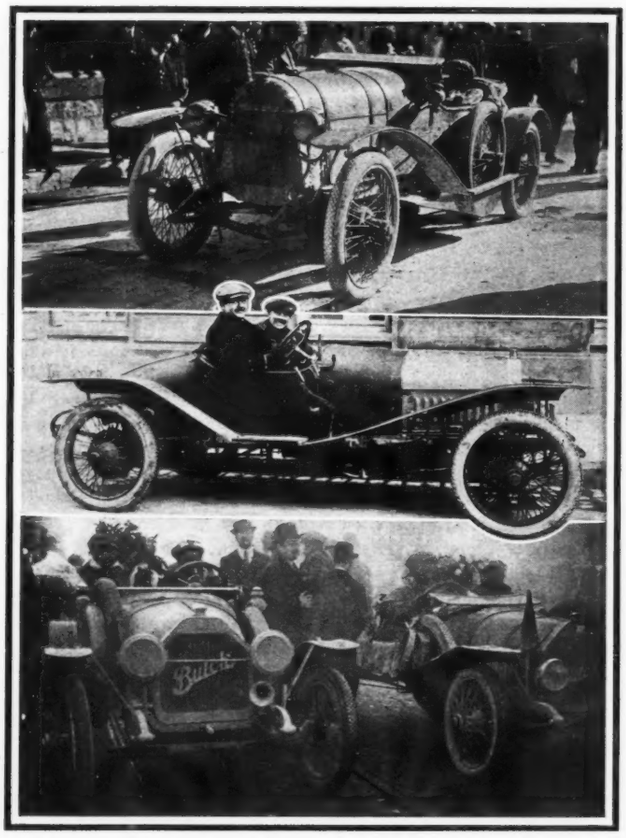
Many Tests Included in Run

Besides being a reliability run of the sealed type, many other tests were incorporated in the rules, these including various hill-climbs, short distance speed tests, and the 67-mile road race at the end of the run in which all thirteen finishers were compelled to compete. Because of this speed requirement the majority of the contestants were two-passenger runabouts made as light and speedy as possible, the majority having streamline bodies, with fenders cut to the narrowest dimension, running-boards higher than the hub-caps and many fitted with disappearing tops and wind screens to cut down wind resistance. These models are generally known as sporting types, and although their motors are under 183 cubic inches, the motors develop 45 to 56 horsepower because of their high-speed characteristics.

The final 67-mile road race was won by a Pierron car fitted with a Bablot four-cylinder motor 3.1 x 5.9 inches bore and stroke, which averaged 58.6 miles in the hour. One of the Buicks made the distance at an average of 46.6 miles per hour and the other at 40 miles.

The most remarkable performance in the speed trials was the little Gregoire which averaged 49.4 miles per hour with its motor 2.7 x 5.5 inches bore and stroke. This little car had been driven throughout the tour and was compelled like the others to take the speed trials at the finish of the tour.

The elimination of the different cars in the thirteen stages of the route which varied from 190 to 279 miles took place practically from the start of the contest. Three withdrew on the first day, one due to overturning on a bend; three withdrew on the second day, two from mechanical trouble one from overturning; one was disqualified on the third day for entering a garage to have some repair work done; in successive stages one was disqualified for arriving late at a control due to colliding with a cart at a cross-road; a Hispano-Suiza withdrew for valve trouble; a Diatto, an



Top—Gregoire which finished second in Tour de France race. Lower two—Buick team which was the only one to finish with a perfect score

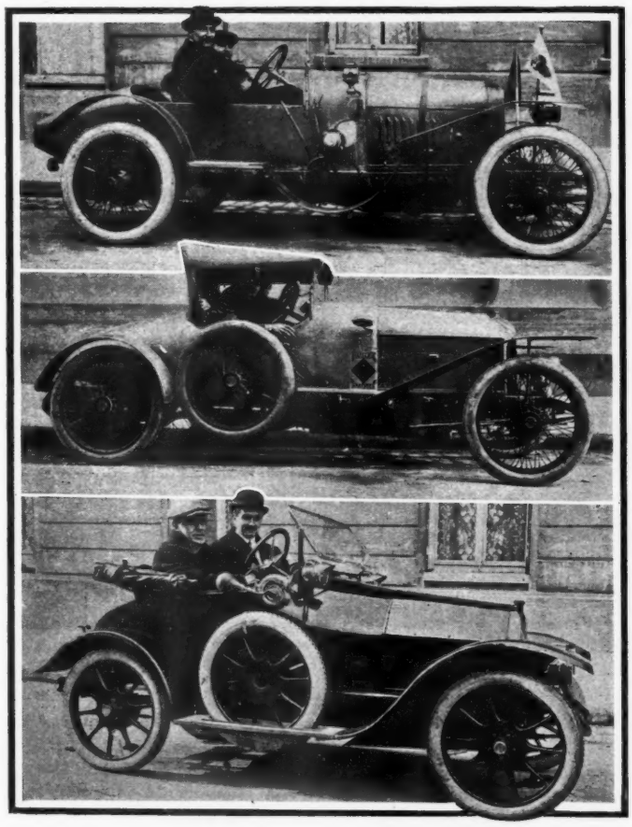
Italian entry, overturned; another withdrew due to breaking a stub-axle in a skid; three Bellangers, with sleeve-valve motors withdrew; and others were disqualified for various infractions of the rules. The Mathias, the smallest four-cylinder in the tour, with cylinders 56 x 100, burned out a bearing when the tour was half over due to oil stoppage. One of the Barres withdrew due to lack of lubrication. Albert Guyot, a racing driver, after covering three-quarters of the distance withdrew because of a cracked cylinder, the Martini car he drove being one of the fastest entered and considered a possible winner. It had cylinders 85 x 132.

Buick Only Team with Clean Score

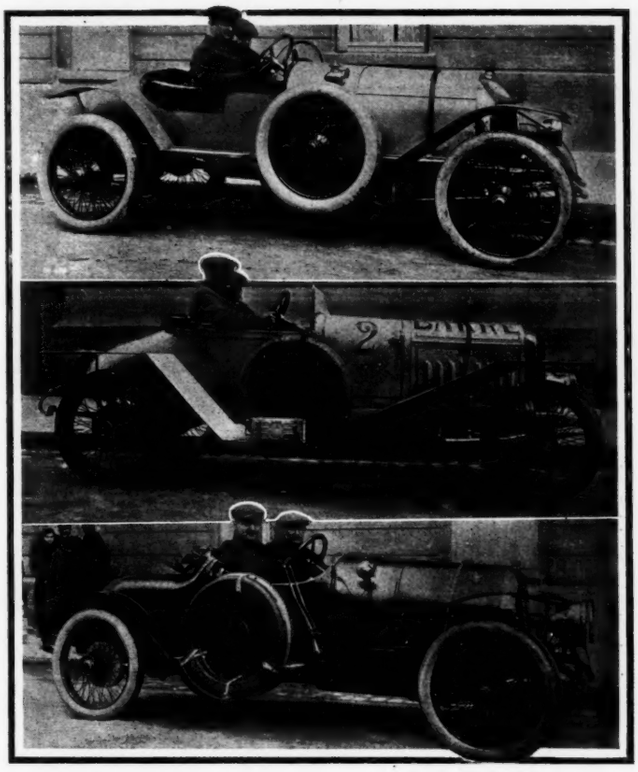
The Buick was the only team entered to come through without losing a single member, two started and two finished. One of them, when half way around France collided with a cow, bending the left frame member, and putting the front axle out of line, which did not prevent the driver continuing, taking part in the speed trials, and ending today with a clean score. The other Buick was the only one to have a self-starter, it carrying the Delco starting and lighting outfit. It finished in excellent condition and was third place in the race at the finish.

Alternating with the daily tour stages were speed trials on the levels or on hills, all competitors being required to compete in these. To avoid night driving, which would have been necessary on the majority of the tour stages, all of the drivers traveled at the highest possible speed consistent with road conditions, and as no one wanted to be last into the night control there was racing nearly all day long.

According to the classification, which was by piston displacement, the divisions were under 61 cubic inches, under 91 cubic inches, under 122 cubic inches, under 146 cubic inches, under 168 cubic inches, and under 183 cubic inches.



Top—Hispano-Suiza with 80 by 130 millimeter motor. Middle—Pierron car. Note touring equipment with racing lines. Bottom—The smallest car in the tour, Mathias of 56 by 100 millimeter bore and stroke



Top—Martini equipped for the tour. Middle—Barre car in the Tour de France. Bottom—Aquila-Italiana as it looked in the tour

There was but one car under 61 cubic inches, this being the Mathias, with cylinder 56 by 100. There was but one starter in the classification 91 cubic inches, this being the Bugatti, with cylinders 68 by 100. This car was one of the thirteen to finish.

The longest stroke in the contestants was 5.9 inches, with a bore of 3.1. The highest stroke-bore ratio was 2 to 1. The average stroke-bore ratio was 1.6 to 1. The Buick, 3.75 inches bore and stroke, was the only square motor in the contest. These cars were fitted with special camshafts to give speed and lighter reciprocating parts.

Two of the three Barre cars finished. These cars used the new Ballot motor 3.1 by 5 9 inches bore and stroke, and they will be offered to the trade next year. The motor uses L-cylinders with integral intake and exhaust manifolds, pump circulation, and force-feed oiling. It develops 58 to 60 horsepower. Previous to the start these cars averaged 58.86 miles per hour over the kilometer with a flying start, and 45.65 miles per hour for the kilometer with a standing start.

The Hispano-Suizas, one of which finished, have over-head valves entirely enclosed, with the camshaft and all valve operating parts working in oil.

The Gregoire which finished second in the speed trials, uses a special high-efficiency motor 70 by 140 millimeters, or 2.7 by 5.5 inches, bore and stroke, giving a piston displacement of 146 cubic inches. These cars previous to the start covered the flying kilometer at 45.6 miles per hour and the standing kilometer at 41 miles per hour.

The following is list of competitors with bore and stroke in each case. All cars have four cylinders:

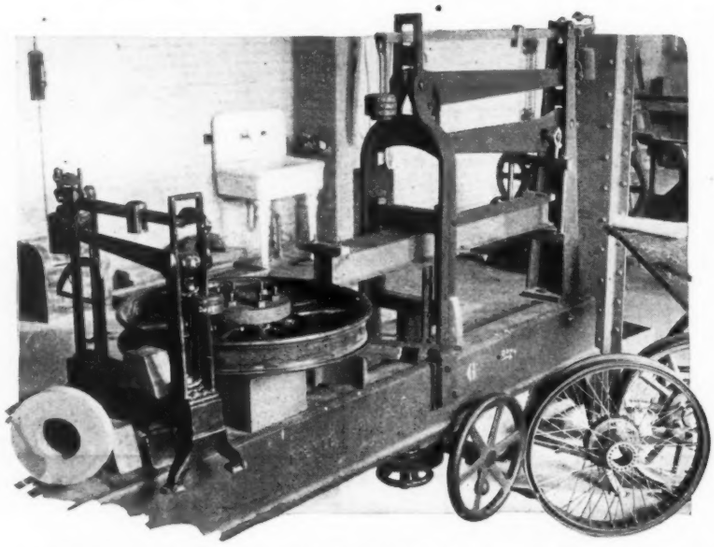
Mathias	2.20 x 3.94	Aquila-Italiana	3.15 x 5.12
Bugatti	2.68 x 3.94	Aquila-Italiana	3.15 x 5.12
Scap	2.64 x 5.12	Hispano-Suiza	3.15 x 5.12
Aquila-Italiana	2.76 x 4.72	Hispano-Suiza	3.15 x 5.12
Bellenger (Knight)	2.91 x 4.49	Diatto	3.15 x 4.72
Bellenger (Knight)	2.91 x 4.49	Diatto	3.15 x 4.72
Bellenger (Knight)	2.91 x 4.49	Georges Roy	3.15 x 4.72
Majola	2.95 x 4.41	Georges Roy	3.15 x 4.72
Phoenix	2.64 x 5.51	Barre	3.15 x 5.91
Gregoire	2.76 x 5.51	Barre	3.15 x 5.91
Gregoire	2.75 x 5.51	Barre	3.15 x 5.91
Scap	2.95 x 5.12	Pierron	3.15 x 5.91
Zedel	2.91 x 4.72	F. A. B.	3.23 x 4.72
Buick	3.74 x 3.74	De Bazelaire	3.15 x 5.91
Buick	3.74 x 3.74	Martini	3.35 x 5.20

Steel Wheel Shows Strength in Tests

Withstands Lateral Pressure of 8,940 Pounds to the Square Inch in University of Michigan Trials

DETROIT, MICH., April 7—The April meeting of the Society of Automobile Engineers brought forth an interesting talk by Max Bachem on some comparative tests of wood, wire and steel wheels as conducted at the Enginering Department of the University of Michigan by F. N. Menefee, civil and hydraulic engineer of that institution.

That the steel wheel is very strong is well enough known, but the data obtained by these tests served to show just what the difference is between the three types. Mr. Bachem, who is representative in this country for the Crown Prince steel wheel, was anxious to obtain accurate data of this nature, and therefore, submitted several of these wheels, together with standard wood and wire types.



Arrangement of testing wheels with the Riehle horizontal machine. Note special hub for each type of wheel. In the test the load was applied at the rim, the effect being the same as when the car skids and the wheel strikes a curb or some similar obstruction at the roadside. Two thousand pounds pressure was applied at first, and this was increased 500 pounds at a time during the tests

The tabulated results show that the wire wheel failed at about 4,000 pounds per square inch; the wood type at 5,000; and the steel at 8,940. The wheels were tested in a Riehle horizontal testing machine, with the support at the hub and the load applied at the rim, just as it would be in case the wheel struck a curb or received any other lateral blow. The load was applied in the same way in each case, and in increments of 500 pounds per square inch. After every 1,000-pound application, the load was brought down again to 500 pounds per square inch and the permanent set or deflection measured.

Spokes Are Electrically Welded

In presenting his data to the engineers, Mr. Bachem first explained the construction of the German wheel, pointing out that the spoke section is made in halves which are electrically welded together along the length of the spokes. The outer ends of the spokes are then spot-welded to the rim. The hub portion is a part of the spoke section, and here is incorporated the demountable feature, since five bolts go through this portion and fasten the wheel to the hub. The Crown Prince wheel was fully described in THE AUTOMOBILE for January 8.

The reports by F. N. Menefee, engineer of the University of Michigan, together with data and curves, were then submitted. In commenting on the data it was pointed out that the permanent deflection of the wire wheel was not measured, because, due to the spring action of the wire wheel, the deflectometer would not register it. Contrary to some tests made in England, in which the nipple heads tore through the rim, the wire wheel tested at the University of Michigan showed remarkable rim strength, the spokes themselves parting, but there being no nipple heads pulling through the rim section.

Deflection at 100

In making the tests with the load applied to the rim of the wheel in the Riele horizontal testing machines shown in the illustration it started at 60 pounds, and of which load neither the Crown Prince, the wood nor the wire wheel showed any deflection. With the weight increased to 100 pounds there was a deflection of .001 inch in the Crown and wire wheels, and twice this amount in the wood wheel. With a load of 500 pounds the deflections were, Crown .016 inch, the wire .024 inch, and wood .013. At 1,000 pounds the deflections were wire .030, wood .033, and Crown .041. At 2,000 pounds the deflections were Crown .068, wood .121, and wire .215. The report follows:

"In general the load increments were made 500 pounds and the corresponding deflection was read under the loaded side and also under the diametrically opposite side. The reading on the side opposite to the loaded side was taken, in order that the tipping of the wheel due to the give in the hub bolt, could be subtracted from the reading under the loaded side to get the actual deflection.

"Commencing at 2,000 pounds and at each 1,000 pounds thereafter, the load was reduced to 560 pounds and a reading taken to ascertain the set, or permanent deflection. The values obtained on the Crown wheel and wood wheel appear reasonable and are believed to be very dependable. Those for the wire wheel were greater in places than the actual deflection and for that reason are not plotted on the accompanying diagram, which shows the set of the Crown wheel and the wood wheel. However it is the opinion of the writer that the set of the wire wheel was large because of the assemblage of so many parts, each of which might contribute a small amount, as for instance, the slight enlarging of the nipple holes, the bending of the rim, bending of the hub and enlarging of the spoke holes at the hub. Inspection of the wood wheel reveals the fact that the rim, backed up by the felloes, deflected practically nothing, the set probably all be-

ing in the spoke at its junction with the hub and the felloe.

"Inasmuch as the wheels were practically of the same size: the Crown wheel being known as a 35 by 4 1-2-inch, the wood wheel as a 34 by 4-inch and the wire wheel as a 36 by 4 1-2-inch and the conditions imposed on each were the same, a glance at the results shows that for this test the Crown wheel was three times as stiff as the wooden wheel at 4,500 pounds load and more than four times as stiff as the wire wheel at that load. In addition to this the Crown wheel was practically twice as strong as either of the others.

"In order to further test the strength of the Crown wheel, a new one was placed horizonally in the 200,000 pound testing machine. The rim was supported on two opposite sides of the hub for approximately a quarter of the circumference. It was then subjected to load by pulling downward on a bolt through the hub. No deflections were taken and no evidence of failure was noted until 24,500 pounds was registered, at which time a sharp cracking sound was heard. The cause of the cracking could not be found. After the load had been run up to 25,000 pounds, the pressure was taken off, the wheel removed and photographed.

"Since the Crown wheel, which was subjected to the load on the rim at the same time as the wood and wire wheels were, had been tested to destruction, it was thought worth while to subject one of these wheels to the same load that the wood and wire wheels failed under, to ascertain the condition of the wheel after the test. Accordingly a new wheel was mounted as shown in the illustrations and subjected to a rim load of 4,500 pounds. Upon removal from the machine the distortion was slight enough not to be noticeable."

Results of Tests on Steel, Wood and Wire Wheels

	CROWN PRINCE WHEEL	WOOD WHEEL	WIRE WHEEL
LOAD ON RIM IN POUNDS.	DEFLECTION IN INCHES.	DEFLECTION IN INCHES.	DEFLECTION IN INCHES.
60	0.000	0.000	0.000
100	.001	.002	.001
500	.016	.013	.024
1000	.041	.033	.030
1500	.055	.075	.12
2000	.068	.121	.215
2500	.086	.161	.310
3000	.099	.210	.425
3500	.100	.260	.486
4000	.11	.312	.533
4500	.122	.362	
5000	.143		
5500	.186		
6000	.233		
8250			
8890			
8940			

Standards Committee of S.A.E. Wants Larger Data Sheets

NEW YORK CITY, April 7—Progress was the feature of the meeting of the Standards committee of the S. A. E. at the headquarters of the Society, 1790 Broadway, completing the first day of the 3-day session. The following four divisions of this committee held conferences in the morning: The Springs; the Frame sections; the Iron and Steel, and the Data Sheet. The reports of these various divisions were presented before the committee which met in the afternoon.

The report of the Springs division brought forth the importance of standardizing spring clip sizes, as well as the tolerances in bushings and spring bolts. More liberal dimensions of spring clips were thought to be advisable, and that part of the table on spring offsets should be struck out.

The data sheet division took up the question of distributing material among non-members and decided to provide individual sheets for those that wanted data on some certain subject.

The matter of increasing the size of the data sheet in order that curves may be produced with sufficient accuracy was taken up as the present size is too small to produce some curves in detail. It was suggested that a fourth volume be adopted for this purpose as it was inadvisable to increase the size of the preceding volumes.

Tomorrow the Motor Testing, Miscellaneous, Electric Vehicle and Electrical Equipment Divisions will meet and the following day the Nomenclature, Broaches, Pleasure Car Wheels, and Ball and Roller Bearings Divisions will hold sessions.

The members present were: Wm. P. Barba, Midvale Steel Co., Philadelphia, Pa.; Herbert Chase, A. C. A.; Chester E. Clemens, Perfection Spring Co., Detroit, Mich.; Arthur B. Cummer, New York City; Arthur M. Dean, Palmer & Singer Mfg. Co., Long Island City; Thomas J. Fay, Cleveland, O.; B. D. Gray, Hess-Bright Mfg. Co., Philadelphia, Pa.; H. L. Greene, J. H. Williams Co., Brooklyn, N. Y.; Leonard Kebler, Ward Leonard Electric Co., Bronxville, N. Y.; R. McA. McLloyd, New York City; Wm. V. Lowe, Hess-Bright Mfg. Co., Philadelphia, Pa.; Allen McMurtry, Sound Beach, Conn.; John A. Mathews, Holcomb Steel Co., Syracuse, N. Y.; K. L. Morgan, Worcester, Mass.; Walter M. Newkirk, William & Harvey, Rowland, Inc., Philadelphia, Pa.; J. H. Parker, Carpenter Steel Works, Reading, Pa.; Harold L. Pope, Pope Mfg. Co., Hartford, Conn.; N. B. Pope, Motor Trades Publishing Co., New York City; C. F. W. Rys, Carnegie Steel Co., Pittsburgh, Pa.; E. F. Russel, Locomobile Co. of America, Bridgeport, Conn.; Henry Souther, Standard Roller Bearing Co., Philadelphia, Pa.; Wm. R. Strickland, Peerless Motor Car Co., Cleveland, O.; Frank W. Traybold, J. H. Williams & Co., Brooklyn, N. Y.; John G. Utz, Perfection Spring Co., Detroit, Mich.; K. W. Zimmerschied, General Motors Co., Detroit, Mich.

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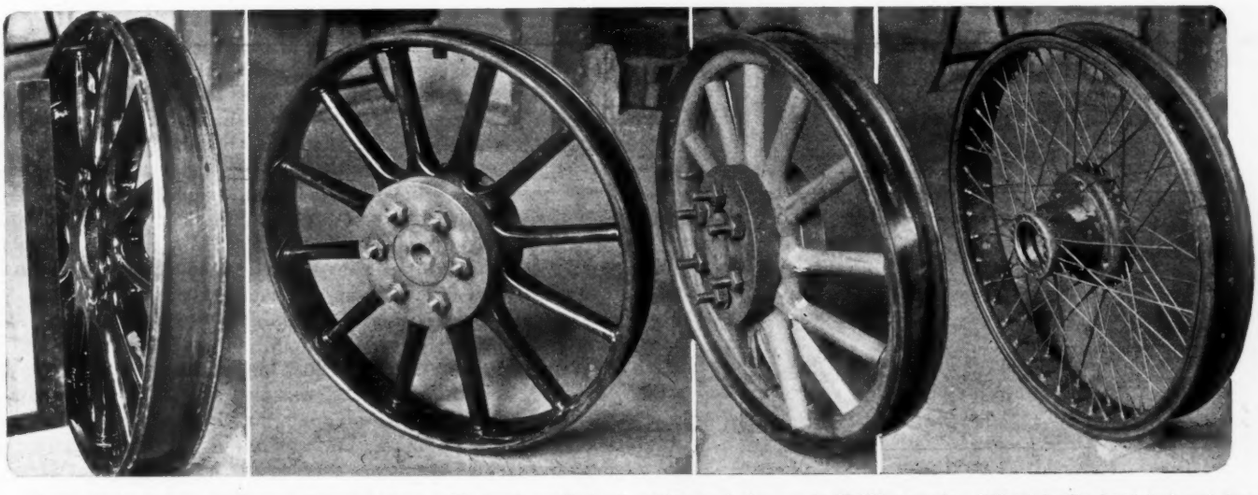
INDIANAPOLIS, IND., April 7—The April meeting of the Indiana section of the Society of Automobile Engineers was held at the Hoosier Motor Club rooms, Claypool Hotel, tonight. "Tendencies in Body Design" and "Vacuum System of Fuel Feed," were the papers by J. C. Collins of the Springfield Metal Body Co., Springfield, O., and Webb Jay of the Stewart Warner Co., respectively.



Left—Second test of Crown Prince wheel with load applied at center and rim up to 25,000 pounds. Wheel badly bent but not fractured and could still be used. No sign of weld opening at any point, or any crack in the metal. The straight edge at the side gives a conception of the amount the wheel was bent. Left Center—Crown Prince wheel at 8,940 pounds when wheel had permanent deflection of 1 inch. One spoke pulled away at hub at 8,250 pounds. Right Center—Condition of wood wheel at failure. One spoke broke at 3,500 pounds, and complete failure at 4,500 pounds. Note substantial hub construction. Right—Appearance of wire wheel at failure. Spokes broke at 4,000 pounds. Beam refused to balance at 4,000 pounds, and at this pressure two spokes gave way. Most of spokes broke 1½ inch from nipple in rim

Qualities of Oil Affected by Use

Tests Made at Manchester Chamber of Commerce Testing House Show That Crankcase Temperature Causes Wide Variations

IT is obvious that comparative tests of a number of oils could be carried out with no special apparatus by the layman by exposing in similar vessels equal amounts of the various oils to a comparatively high temperature, say, in an ordinary oven, for a considerable period and then examining the residue for quanity and properties.

Some years ago we carried out tests on a wide range of petrol engine oils in the belief that the simple heating of 1 gramme of oil to 400 degrees Fahrenheit for six hours would show really appreciable differences and furnish a test of practical value.

The Range of Oils Tested

Generally speaking, gas engine oils and the cheaper oils gave the worst results, though the thick steam cylinder oils gave results practically equal to the most expensive air-cooled oils. The viscosity of the black cylinder oils was, of course, against their use for gasoline engines, but we ventured to experiment with one obtained at 22 cents per gallon and mixed with 10 per cent. of ordinary paraffin to reduce it to a reasonable viscosity. The original oil had an exceedingly low loss on the heat test, and after the addition of 10 per cent. of paraffin it was found that the total loss was only 6 per cent., showing that something like half the paraffin was retained by the lubricating oil even after 6 hours heating at 400 degrees Fahrenheit. Five gallons of the mixture was used on two different cars, and no difficulty of any kind was experienced in use.

Table I. contains a collection of results of experiments on a large number of oils carried out for the most part a considerable number of years ago.

The heating experiments were carried out in all cases on 1 gramme of the oil in small beakers about 1 inch diameter heated on a paraffin bath. At the end of the test the oil was allowed to cool down to room temperature and the beaker inclined. Obviously the oil which loses the least and leaves a residue most like the original oil is the most desirable sample.

TABLE I.

	Velocity—At 200° F. Secs.	Velocity—At 400° F. Secs.	Close Test Flash-point. ° F.	Loss Tests 6 Hrs. 400° F. %	Effect.
Price's Gas Engine	44½	29	401	61.35	S.L.
Heath's Gas Engine	45	29½	365	86.95	D.N.R.
Price's Motorine C	71	35	392	22.52	R.R.
Vacuum N (air-cooled)	118	35	419	7.54	R.R.
Vacuum A (water-cooled)	54	31½	383	45.12	R.R.
A. Dark cylinder	160	36½	473	1.46	D.N.R.
B. Filtered cylinder	118	37	464	8.10	D.N.R.
C. Heavy American	71	..	..	56.04	D.N.R.
D. Heavy Russian	55	30	349	54.37	D.N.R.
E. Gas engine basis	47	31	374	65.43	D.N.R.
F. Blended oil	75	32	424	56.16	S.L.
G. Morris' Speedon (air-cooled)	107	38	455	7.71	R.R.
H. Ditto (water-cooled)	77	35	428	16.41	R.R.
I. American	50	31	428	25.88	R.R.
J. Similar to I.	46	31	415	40.94	R.R.
K. Fine filtered	152	39½	500	1.51	D.N.R.
L. Similar to K.	160	42	509	2.11	D.N.R.
M. Heavy Russian	73	34	428	14.65	R.R.
Autolubrine	61	32½	374	33.15	R.R.
Price's Motorine A	130	37	492	7.60	R.R.
G. B. 1 (air-cooled)	60	30	383	63.83	D.N.R.
G. B. 2 (water-cooled)	71	33	410	50.30	S.L.
Wellsaline (air-cooled)	90	35	414	33.79	D.N.R.
N. mixed K and I 4/1	127	39	464	18.10	D.N.R.
Belsize oil	68	34	401	21.80	..
Humber oil	56	31	383	..	..
Pennsylvania	80	..	464	3.78	..
Snowdon	59	33	390	38.63	..

D.N.R.—Does not run.
S.L.—Runs slightly.
R.R.—Runs readily.

Relation Between Flashpoint and Heat Loss

A cursory glance suffices to show that there is very little connection between the flashpoint of an oil and the result of the loss test. In order to bring this better into prominence Table II. shows the oils arranged in the order of the flashpoint and the corresponding heat loss at 400 degrees Fahrenheit given below. Fig. 1 shows these results graphically, and the frequent occurrence of a number of oils of the same flashpoint and very different heat loss emphasizes the impossibility of relying too fully on flashpoint figures.

Experiments on the rate of loss in weight of an oil at two or three temperatures enables one to tell whether the oil as a whole is fairly homogeneous or whether it contains several constituents of very different character.

Fig. 2 shows the loss in weight on heating a sample of Vacuum A for various lengths of time at various temperatures. At 300 degrees Fahrenheit in 24 hours the oil has lost 23 per cent. of its weight. From the appearance of the curve it would appear that further heating would have resulted in further loss. The single experiment at 350 degrees Fahrenheit for 5 hours shows that this same oil lost as much as it would have lost in about 15 hours at 300 degrees Fahrenheit, and in 2 hours at 400 degrees Fahrenheit it had lost as much in weight as in 24 hours at 300 degrees.

Table III. records a series of experiments on the heat losses of various oils at various temperatures, and it is interesting to note that in almost all cases the loss in 6 hours at 400 degrees Fahrenheit is almost always equal to the loss in 48 hours at 350 degrees Fahrenheit, and that the order of the loss remains pretty well the same within the times and range of temperature of our experiments.

This brings us to the consideration of the influence of temperature on the viscosity, that is the thickness of lubricating oil. Most of the available data are those dealing with viscosity of oils between ordinary temperatures and 200 degrees Fahrenheit, but in crankcase lubrication we have to do with temperatures on the cylinder walls which much exceed these, and we have carried out a number of experiments on the viscosity of oils at higher temperatures, the results of which are contained in Table IV.

It will be seen that the differences in the viscosity are comparatively slight at higher temperatures. This is a characteristic, particularly of mineral oils. The rate of falling off in viscosity of animal oils such as sperm and lard oils, and vegetable oil such as castor oil, is not quite so rapid, and this property, conjointly with the extra oiliness of animal and vegetable oils, has led to their utilization in racing car engines. Owing to the comparatively high temperatures of crankcase oil there is no danger that an oil will be too thick when once it has got into use in the crankcase. We must, however, use an oil which at ordinary temperature is sufficiently fluid to pass through the constrictions of the lubricating system, and this alone marks the maximum limit of allowable viscosity.

Having been struck by the great fluidity of oil taken from

the crankcase when it was not very warm we determined to investigate samples taken from the crankcase after use, and this led to some interesting discoveries. A certain oil before being used gave heat losses as shown in Fig, 3. The plain line shows the amount evaporated on heating the original oil, *i.e.*, before use, and the dotted line shows the amount lost on heating the crankcase oil, *i.e.*, after use, under similar conditions. It will be seen that the total loss in this case was greater with the crankcase oil, but the most striking feature is the increased loss at low temperatures, the subsequent course of the oil being practically parallel to that of the original oil. The specific gravities of the two oils are very close, that of the crankcase oil being taken on the filtered sample.

Further experiments detailed in Table V. were carried out on oil from another engine. The crankcase oil was filtered before the physical constants were determined.

These results were in some regards unexpected. The great increase in the fatty oils requires investigation, and we can offer no explanation beyond that of possible oxydation. The loss on heating seemed at first sight abnormal. The viscosity test shows that the crankcase oil is distinctly more fluid especially when cold, but the more the oil is warmed the closer becomes the viscosities. This points to the presence of some easily volatile constituent.

The fact that the flashpoint of the crankcase oil his gone up after removal of the easily volatile constituents boiling below 160 degrees Centigrade proves that the increased fluidity of the heated oil at low temperature is not due to the splitting up of the oil into a volatile portion leaving a heavy residue. It would rather seem due to internal alteration in the molecular structure. This calls for investigation.

Heavy Cylinder Oil Tried

Arguing from the standpoint that the crankcase oil after use became more fluid from the presence in it of some easily volatile constituent, the amount of which, however, did not seem to increase beyond a certain limit, we decided to use a heavy cylinder oil so viscous that at ordinary temperature it would scarcely run through a ½-inch pipe. In order to make this oil suitable for drip feed lubricating arrangements 10 per cent. of ordinary paraffin was added. This dark mixture then had a viscosity about equal to an average motor oil for water-cooled engines.

As regards the flashpoint the results are practically the same as those found in the oil from the Wolseley car, and the same drop in viscosity is observable. Heating the crankcase oil to 300 degrees Fahrenheit for 1 hour shows it was more fluid at low temperature and less fluid at high temperature than the original oil. Obviously this heating removed the material which was the cause of the low flashpoint. A liter of the crankcase oil was heated, and Fig. 4 shows the results. The distillate which was exactly 2 per cent. of the original sample had a specific gravity of .7656, and was something between ordinary gasoline and paraffin oil in its nature.—From *The Autocar.*

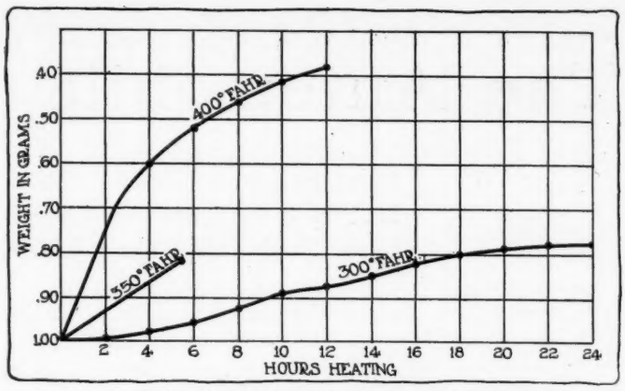


Fig. 1—Connection between heat loss and flash points

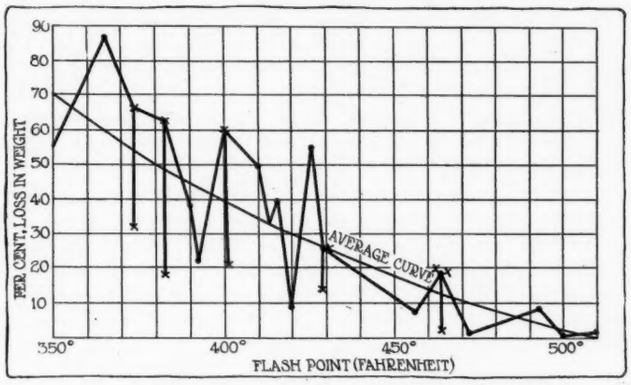


Fig. 2—Effective temperature and time on heat lost

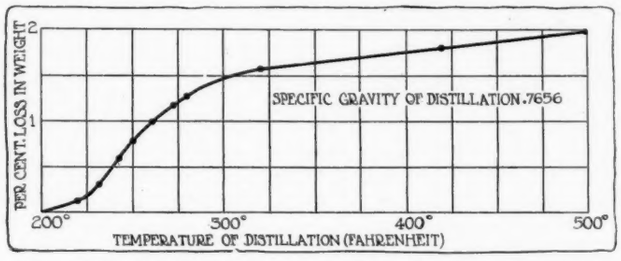


Fig. 3—Heating for an hour and increasing the temperature

TABLE V.

	Original Oil.	Crank Case Oil.
Specific gravity	0.900	0.904
Flashpoint	276° F.	230° F.
Viscosity at 75° F.	1,530 secs.	1,390 secs.
Viscosity at 100° F.	725 secs.	670 secs.
Viscosity at 125° F.	267 secs.	259 secs.
Viscosity at 150° F.	140 secs.	138 secs.
Viscosity at 200° F.	76 secs.	74 secs.
Viscosity at 400° F.	36 secs.	35 secs.
Mineral oil	99.77%	98.74%
Fatty oil	0.23%	1.26%
Loss on heating 6 hours at 400° F.	26.3%	22.6%
Effect	Runs slightly.	Runs moderately.

TABLE II.

Close Test Flashpoint, ° F.	349	365	374	374	383	383	383	390	392	401	401	410	414	415
Heat Loss 6 Hours, 400° F. %	54.3	87.0	65.4	33.1	63.8	18.1	45.1	38.6	22.5	21.8	61.3	50.3	33.8	40.9
Close Test Flashpoint, ° F.	419	424	428	428	428	455	464	464	464	473	492	500	509	
Heat Loss 6 Hours, 400 ° F. %	7.5	56.2	14.6	16.4	25.9	7.7	18.1	3.8	8.1	1.5	7.8	1.5	2.1	

TABLE III.

Loss on heating:	Price's Gas. Engine. %	Heath's Gas. Engine. %	Price's Motorine. %	Vacuum N. %	Vacuum A. %	A. %	B. %	C. %	D. %	E. %	F. %
5 Hours at 350° F.	28.66	54.58	10.18	1.93	17.22	1.00	2.49	22.74	26.92	29.10	11.75
48 Hours at 350° F.	59.68	85.13	23.94	6.00	52.07	1.74	8.21	56.5	51.44	66.09	37.66
6 Hours at 400° F.	61.35	86.95	22.52	7.54	45.12	1.46	8.10	56.04	54.37	65.43	56.16

TABLE IV.

	Price's Gas Engine.	Heath's Gas Engine.	Price's Motorine.	Vacuum N.	Vacuum A.	A.	B.	C.	D.	E.	F.
Viscosity at 200° F.	44.4	45.0	71.0	118.0	54.0	160.0	118.0	71.0	55.0	47.0	75.0
Viscosity at 300° F.	34.4	33.0	43.2	47.6	37.8	..	..	..	..	..	..
Viscosity at 350° F.	32.4	32.2	37.6	42.6	34.2	..	..	..	..	..	..
Viscosity at 400° F.	29.2	29.4	34.8	34.8	31.6	36.6	37.0	..	30.0	31.0	32.0

The Automobile Engineers' Forum

Good Salesmanship May Make a Poorly-Designed Car Popular, But Not for Long—Engineering Cost Goes Up as Selling Price Goes Down—Economy in Factory Layout—Special Machines

HOW often do we hear an automobile engineer's effort deprecated with the comment: "Yes, the car is an unfortunate one, but the salesmanship behind it will make it go."

Many times this is true, particularly in the low price field. Little the people whose investment is at stake appreciate the ultimate expense and wasted effort of superior selling intelligence supplementing a mussy car. Only occasionally has a manufacturer awakened to the knowledge, that, as the price of the car comes down, the engineering talent involved goes up; at least to design a sound layout within the specifications and costs.

To draft a car without restrictions simply voices clever mechanics, but to produce in the field where the focus of competition strangles at the first unguarded movement calls for thorough technical knowledge of the most analytical kind, and a practical capacity only comprehended by those knowing tools, with instinctive skill, in almost every line of manufacture and material fabrication.

Practical Knowledge Necessary

What man can set himself up to design a frame of marked individuality in meeting involved strains, in the cheapest production, unless he knows sheet metal and can earn his salt running shear, press, drill, pneumatic gun, or do other constructive labor on the part? Co-operation with specialists in detail manufacture can never rise superior to the logical reasoning of an actually broad engineering mind. Two intelligences well versed in a half can never bridge communication so perfectly that the whole will not disclose a lack of homogeneous timber.

Poor Design Does Not Survive

Average investing capital other than the trusting sort is apt to depreciate the engineer to one who throws off layouts that will go together and run, not appreciating that a design unsound in its initial conceptions can never support the superstructure of a successful manufacturing campaign. The car with myriad catch-penny features may win in a skirmish, but if the design is not inherently economical of production, and in selling, you may as well try to carry water in a bottomless pail as to endeavor to make long-run money out of the organization.

Let us contemplate for a moment the only commercial car evolution and we will appreciate the general futility of the mediocre producer struggling with a ponderous and inefficient engineering department, in a vain effort to strike that harmonious, well-hung, and instantly popular vehicle which is the natural expression of the good automobile engineer.

An Ear to the Ground

First and paramountly you need to know your market, not only that which your salesmen serve, but all, if you are designing extensively. Unfortunately the style cat is not through jumping about the automobile industry, although she is less nervous than formerly. Should you lay down a detail impossible of marginal change to later accommodate demands of the sales department you impose a handicap which may cause the house great indirect loss or result in a botch which makes that run of cars a fester in the concern's reputation. Certain progressive changes readily discernible at the present day will inevitably come, and they even now shine through the tangle called fad; yet were we to incorporate half of them in any of our present designs we would be guilty of designing ahead of the market. What is more valuable is to so handle your technique that it will not be contemporaneously conspicuous but strongly latent in maintaining a high second-hand value for the car as a negotiable asset. This feature cannot be neglected in the future, as it has been in the past.

Points That Sell

Second, but perhaps most important, comes the value of the design in hammering home the efforts of the field salesmen. This is not to be confused with giving him such that all he has to do is to show the car, but to assemble the line of defense so that natural, and not strained, approach, will bring out the salient and superior points in a class. No salesman cares a fillip whether an upset is hydraulic or bulldozed, but he does appreciate a neat floor board assembly. To spread your engineering butter with unerring apportionment and aggressiveness at all points is not ordinarily attained, but measures lasting success. How often "sitting into the garage ring" we hear that almighty "but," singular and plural, tacked to a car enjoying an advertised reputation.

Thirdly, must we study the individual equipment and personnel of the organization conducting the business. As an example, should they be unlikely to countenance fairly liberal replacements, you will enhance their reputation by quietly raising the quality to balance the saving you think will measure up to hard feelings with customers. This may be claimed irrelevant and better policy anyway, but there is such a thing as saving people from themselves; and after all business is done first, last and always by human beings.

Are Special Machines Needed?

After psychological allowances, follows the shop, and here we reach a parting of the ways. Some designs evolve the shop and some shops evolve the design. The first is bound to obtain if the engineering responsibility has not actually served before the mast. Particularly does it stand out as the size of the business aspires to quantity production. Be it assembling or true fabrication, efficient handling of the design by the hands of the workman and their wherewithal, may scale many thousands of dollars at the fountain head when the yearly balance is struck. This fact is intimately connected with the question of special machinery, and I think that all machine tool builders will unanimously support the statement that special tools are more frequently the result of unadaptable and falsely crystallized designs than are they initially conceived hand in hand with the part. Standard tools are a quick marketable asset, while special ones are not, and, as a rule, unless the production is very high, the special stuff more often enhances somebody's reputation than saves the concern real money. Therefore your car should fit the old glove if the quantity is fairly the same.

The simple fact that your layout costs so much for ma-

terial and so much for labor does not mean that this represents production cost, by a great deal. For one shop you may be held to the same figure and put down a car greatly superior to the next one where quality must balance commercial considerations beyond your control. Likewise have I seen correct and experienced engineering judgment redesign a losing line of models into a plugging money-maker without the sales handling knowing the difference or suffering a drop in efficiency from change of habit.

Hobby Horse for Boys

Looking through these perspectives elucidates in a general way the fact that the matrix wherein the car is conceived must not only be of exceptional technical ability, but must be a good business head, a student of human nature, an artisan of the highest water, and a mixer and born diplomat of the most democratic attainments. And lastly, the best man under these colors that was ever born will negative everything if he rides a hobby. In most cars you will find some form of this, and generally the first place to look for it is where the salesmen make the best of a bad bargain by exploiting exceptionally exclusive features. To incorporate your personality is one thing, but to ride your hobby indulges your pleasure only.

A Logical Design Adds Value

Produce a logical design from all premises and you enhance commercial value, as the car then brings together all the warp and filler of the organization into a composite effort, effective in everyone's endeavor, but unobtrusive through some particular fault needing unproportional attention.—C. S. COLE, general manager, Electrical Engineering and Storage Battery Co.

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Waldon's Engineering Views in Print

DETROIT, MICH., April 4—In simple language, S. D. Waldon, chief engineer of the Packard company tells in a sixteen page booklet, the whys and wherefores of six-cylinder design in general and Packard practice in particular. The booklet, which has just come from the press, is liberally illustrated with charts designed to bring out graphically Mr. Waldon's views of automobile design.

The reasons he advances for the six are its freedom from vibration and continuity of power impulse. In mentioning its freedom from vibration Mr. Waldon states that this more than makes up for the difference in thermal efficiency which favors the four on account of the smaller wall surface.

In speaking of the power impulse continuity he mentions the great advantage this gives in tire saving and states that when the Packard racer, Gray Wolf, had passed over the Florida beach at 80 miles an hour it was possible to count the power impulses by the imprint of the tires in the sand.

Many other features of Packard practice are taken up and the reasons for their existence given. The double exhaust for six-cylinders is said to do away with overlapping exhaust, the Packard stroke-bore ratio of 1.33 is designed to be a happy medium between the long and short-stroke motors, the lubricating system is said to take care of extreme cases by forcing oil to the cylinder at high speed and by preventing an excess of low speed.

L-Head Versus T-Head Motors

The L-head-versus-T-head question is brought up in the booklet and dismissed by Mr. Waldon by claiming greater simplicity and more power at high speed for the L-head. Packard passenger cars are L-head while the trucks are T-head. The reason for the T-head truck motor is that the motor never runs at the high speeds at which the T-head is said to be objectionable, and since Packard started building T-heads in 1906 it would destroy the interchangeability if this type were now abandoned.

New Electric Shift

—

Continental Is Controlled by Keyboard Operating a Set of Solenoid Magnets

DALLAS, TEX., April 4—A new electric gearshifter mechanism, known as the Continental, has been brought out in Dallas. This mechanism makes use of the solenoid magnet principle and is controlled by a keyboard in a similar manner to those which have already been described in these pages.

The layout of the device consists of a set of solenoids, one for each speed, control keys, selector, neutralizer and locking device. Outside of these there is a clutch pedal lock for special work, which will be described later.

For a three-speed gearset there are five buttons on the keyboard, controlling five independent solenoid coils. The buttons are for low, intermediate and high speeds, reverse and neutral. When each button is pressed it sends a six-volt current through its respective solenoid, energizing the magnet at a cost of 2.5 amperes.

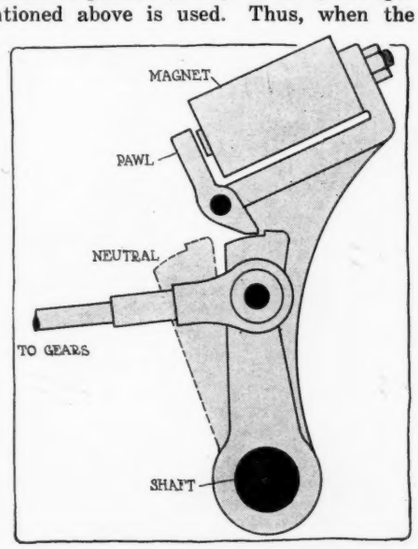
Magnets Travel 30 Degrees

When the magnet is energized a small pawl beneath it reaches forth, and on depressing the clutch pedal this pawl catches on the arm of the gear desired and pulls it into mesh. The magnets are carried side by side on the selector and only the pawl actuated by one magnet can at any time be in a position to engage a gear, due to the locking arrangement. The magnets travel through a segment of about 30 degrees when the clutch pedal is depressed.

Referring to the illustration on this page a neutral pawl will be seen in position. This pawl is actuated by a magnet that is always in series with the battery. Therefore, regardless of what button is depressed, the neutral magnet is thrown into operation and the neutral pawl reaches forward and carries the gears back to neutral before the change is effected. If the neutral button is pressed the neutral pawl acts independently and throws all the gears in neutral.

The connection of the neutral pawl is so arranged that it engages with any gear that happens to be in mesh before the pawl controlling the desired gear comes into operation. When the neutral button is pressed alone, however, the special cluth lock mentioned above is used. Thus, when the neutral button is pressed the gears are not only in neutral, but the clutch also is disengaged. With the clutch disengaged, the operator can select any gear he desires without any danger of clashing the gears, as would happen were the clutch not disengaged.

In case the operator desires an ordinary shifting lever the mechanism can be arranged to allow of its use.



Solenoid and selector mechanism on the new Continental electric gearshift

One Pass Book Admits to All Europe

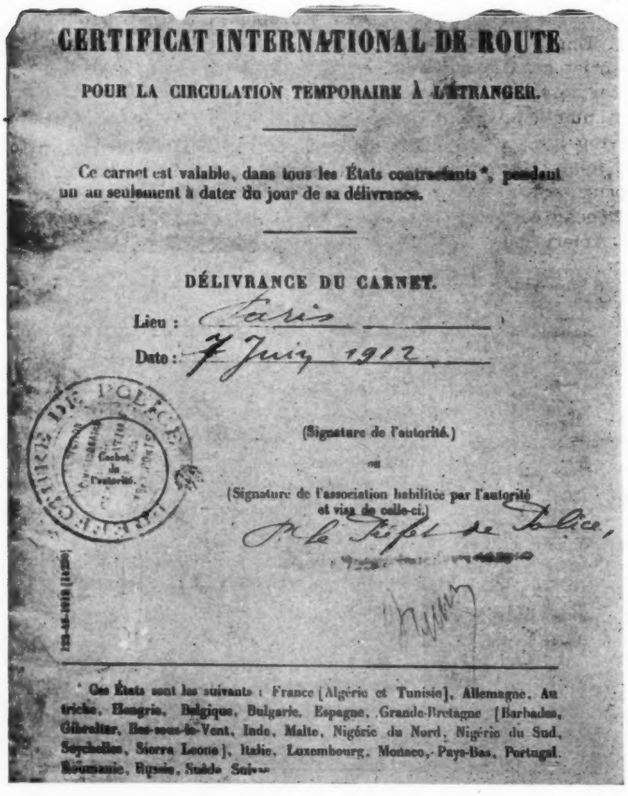
Thirteen Countries Have Agreed on New System of Pass-In and Pass-Out Checks—Tourist Not Limited in Number of Visits

By W. F. Bradley

USING a single pass book it is now possible to take an automobile through the customs houses of practically every country in Europe with no more formality than a few signatures and without any monetary transactions whatever. This new system which will completely liberate the motorists from delay, annoyance and complications at frontier stations is the crowning work of the national automobile clubs of the Old World. With this new pass book, to come into force early in January, there is frequently less formality in passing from one European country to another country than in passing from one American state to an adjoining state.

Two Old Systems

Travelers through Europe are acquainted with the old system. There were really two: the old-fashioned method of carrying a bag of gold, depositing the necessary amount at the frontier station of the country entered, and collecting it, after much difficulty, on leaving that country; or, of applying for a triptyque for each of the countries to be visited, the necessary guarantee for the triptyque being deposited with the home association issuing the document. The triptyque was an immense advantage over the old-fashioned method. Nevertheless, it had its weak points. A separate triptyque and a separate deposit were necessary for every country visited. If, on leaving a country a motorist forgot to have his triptyque signed at the frontier station, endless complication arose. Cases have arisen in which a motorist has been obliged to drive across the full width of Europe in order to present his car and obtain a neglected signature.



CERTIFICAT INTERNATIONAL DE ROUTE

POUR LA CIRCULATION TEMPORAIRE À L'ÉTRANGER.

Ce carnet est valable, dans tous les États contractants *, pendant un an seulement à dater du jour de sa délivrance.

DÉLIVRANCE DU CARNET.

Lieu : Paris

Date : 7 Juin 1912

(Signature de l'autorité.)

ou

(Signature de l'association habilitée par l'autorité et visa de celle-ci.)

* Ces États sont les suivants : France [Algérie et Tunisie], Allemagne, Autriche, Hongrie, Belgique, Bulgarie, Espagne, Grande-Bretagne [Barbades, Gibraltar, Iles-sous-le-Vent, Inde, Malte, Nigérie du Nord, Nigérie du Sud, Seychelles, Sierra Leone], Italie, Luxembourg, Monaco, Pays-Bas, Portugal, Roumanie, Russie, Suède Suisse

Front page of international car and driving license checks to be given up at the frontier station

One Deposit for Thirteen Nations

The new customs pass book has been made possible by an agreement between thirteen European countries, whereby a single deposit has to be made equal to the highest duty of any single country. This will be the duty required by Spain, Austria, or Sweden, according to the nature of the car.

The international passbook, which is printed in French with explanatory notes in every European language, consists of a series of pass-in and pass-out checks. When entering the first foreign country, the customs officer tears out a pass-in check and gives a marginal receipt for it. On leaving that country the book must be presented at the frontier station for the pass-out check to be withdrawn. Pass-in and pass-out checks alternate, and the officers will absolutely refuse to take a pass-in check until the preceding pass-out check has been withdrawn.

This is a most important feature of the scheme. Supposing, for instance, a car passed from France into Switzerland without stopping at the French station to get a discharge, the pass-out check would remain in the book. The Swiss officer would point this out, and the motorist would either have to drive back to the French station to get his discharge, or else pay cash duty and forfeit further use to the book. To allow him to pass into Switzerland without having obtained his discharge from France would mean that the car would be officially in two countries at once and would entail endless complication.

Frontier Stations Close Together

As frontier stations are never more than a mile or so apart, a failure to get a discharge would be observed without delay and a motorist who wished to make a proper use of his pass would be able to return and get his discharge within a few minutes. It is quite easy to leave a country without noticing the customs office and to pass over the frontier without being aware of it. It is impossible, however, to enter the adjoining country without being stopped at the first customs station.

New Pass Is Unlimited

One respect in which this new pass has an enormous advantage over the triptyque is that it allows the holder to pass over a frontier any number of times. With the triptyque, provision was made for either a temporary or a permanent discharge on leaving the country. If the motorist asked for a temporary discharge, he was under an obligation to return at some later date in order to secure a permanent discharge. If he asked for a permanent dis-

charge in the first instance, it was impossible for him to return, however much he might desire to do so, without obtaining a new triptyque or paying duty at the gates. This limited the usefulness of the triptyque, for on going out the motorist had to know definitely whether he would return to that country or not.

Smaller Deposits Now Needed

To tour through the whole of Europe on the triptyque system, taking out a separate triptyque for each country visited, would require a deposit of about $2,600. This is calculated on a medium-size five-passenger touring car. Under the international pass-book system, the deposit required would be $400 to $450, according to whether the rating was made on car weight or car value basis.

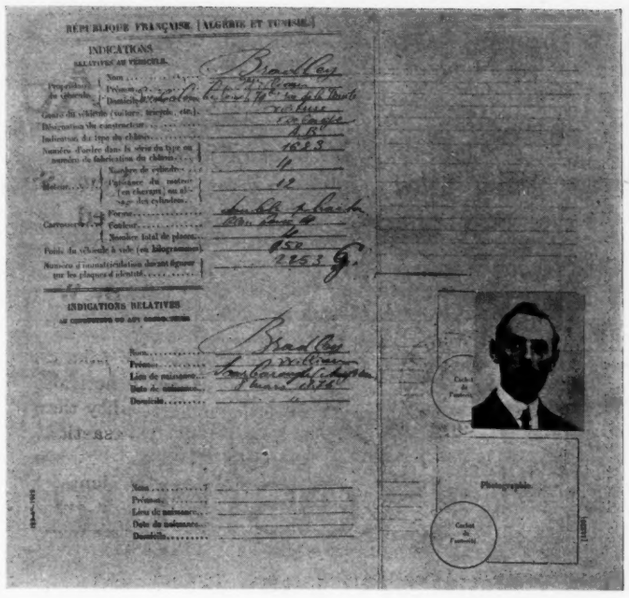
The pass book is available for the following thirteen European countries: France, Switzerland, Belgium, Italy, Spain, Sweden, Austria, Russia, Hungary, Denmark, Holland, Norway and Roumania. There being no duty for Great Britain, that country is not included.

It will be noted that the only important absentee is Germany. When the delicate negotiations were opened with a view to the realization of this scheme, Germany, in common with other countries, presented numerous objections. Little by little these difficulties were overcome but the Germans' claim that the pass book should be printed in German as well as in French was impossible of realization without destroying the necessary simplicity of the document. Finally the German authorities declined to take part in the scheme. The result is that a holder of this pass cannot enter into Germany otherwise than by taking out a triptyque or by paying cash duty. German automobilists are the greatest sufferers, for they have no right to use this pass book and cannot even obtain it as members of a foreign automobile club.

Work To Be Done at Washington

The United States is not a party to the agreement, but this does not prevent citizens of the Great Republic obtaining the same facilities as Europeans. It is recognized that until the individual states of the union agree to uniform automobile laws it is impossible for Washington to offer to Europe the facilities that Europe can offer to America. This is not the fault of the American automobilist and Europe has recognized it by a kindly courtesy which will doubtless be appreciated at its true worth.

For a journey through one, or probably two, European countries the new pass book offers no great advantage over

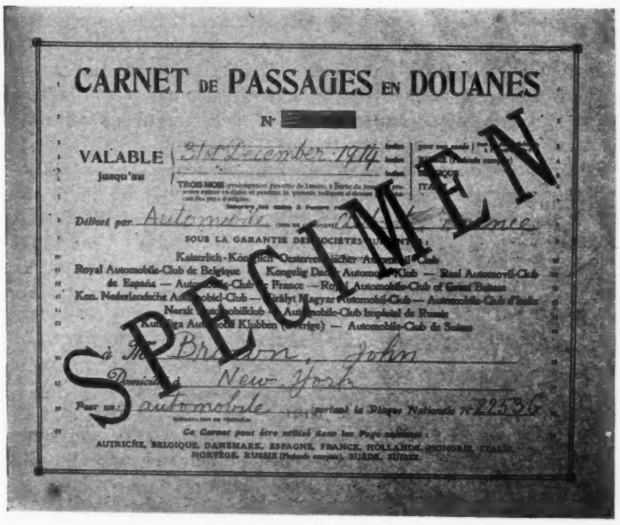


International car and driving license with portrait of holder

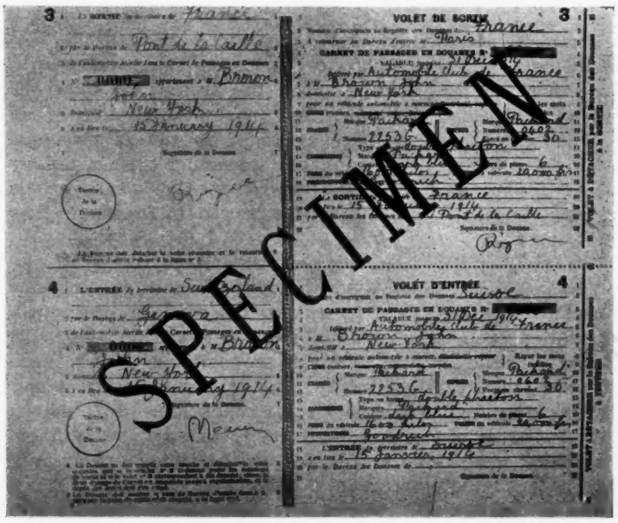
the present triptyque. Its value will be immense when several countries are being visited. It should be borne in mind that the new customs pass book facilitates the passage of the car and its accessories only through the customs. Motorists are not treated differently from any other class of travelers as regards personal baggage.

Registration and License Simple

As a complement to the customs pass book is the international driving and car license. This has now been in use for about 3 years and is well known to all Americans who have toured Europe. It is a combined driving and car license, recognized by seventeen European countries and several English and French colonies, by the aid of which a motorist can travel from Wick to Syracuse and from Gibraltar to the Ural mountains without a change of registration number and without making application for a fresh driving license. Although the United States government has not joined in this scheme, American citizens are allowed to procure an international car and driving license through any European country, an exceedingly satisfactory arrangement for Americans, at least.



International customs passbook used in European countries



International customs passbook, showing pass-in and pass-out

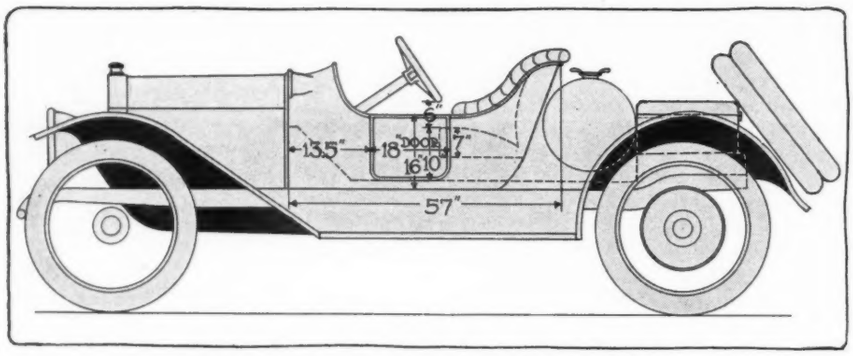


Fig. 1—Sporty runabout design for Buick model 10

The Rostrum

Inaccessibility Due to Low Production Cost

EDITOR THE AUTOMOBILE:—Accessibility, notwithstanding what has been said and written to the contrary, is more mythical than real as far as the modern automobile is concerned. Here and there a manufacturer will improve a new model in this particular providing it does not raise the cost of manufacture, but progress, on the whole, in car accessibility has been slow and inconsistent.

It is almost as much trouble to make adjustment and repairs on the car of to-day as it was on the machine of 10 years ago, and considering the addition of starting and lighting systems, motor-driven tire pumps and other conveniences, it is a serious question whether the cars of to-day are not harder to get at than the machines of a decade ago.

Designers have had two goals in mind: to make changes that would reduce the manufacturing cost and to add features to appeal to the buyer. They are apparently oblivious of the fact that the most appealing talking point their car could have would be complete accessibility, so that every part could be removed without disturbing any other part, so that every adjustment might be made without inconvenience or without removing other parts.

Accessibility Worth the Expense

Complete accessibility would be worth the expense that would be required in order to change the design to give it, providing the manufacturer took the trouble to show the prospective owner the amount of money he would save in repair bills if his car were arranged so that a mechanic would have to spend the minimum amount of time in repairing or adjusting, and not be required to take down various adjacent members before giving attention to the parts that really need it.

A few examples from my own experience will show the importance of accessibility both from the point of convenience and of saving time in making the repairs. I recently was called upon by a friend of mine to determine the cause of water in the lubricating oil in the crankcase. Investigation showed that the trouble was caused by worn pump packing, the pump being inside the crankcase. In order to put in new packing it was necessary to take off the radiator, the timing gear cover and loosen up the mud pan. It only took a few minutes to repack the pump, but more than 2 hours to remove the other parts and replace them. The manufacturer's object in placing the pump in this position undoubtedly was to reduce the cost of manufacture and to simplify the exterior of the engine.

Another case of inaccessibility was that of the steering gear adjustment on a prominent car. Wear is taken up by turning a nut on the side of the gear next to the motor, the nut being so placed that a special tool is required to tighten it. But worse than that the position of the nut is such that a man would be unlikely to find it unless he knew it was there. On this same machine, when it is necessary to drain the oil from the crankcase, the mud pan must be removed, as it is impossible to unscrew the plug without doing this. This was undoubtedly an oversight on the part of the maker, as it would not have cost very much to cut a hole in the pan right under the plug.

Another car I have had some experience with has the starting motor below the flywheel so that when it needs attention the mud pan must be loosened. But examples of carelessly placed electrical apparatus are numerous, as most owners can testify to their sorrow. Several machines I know of have the generators, starters or both in such a position that it is almost, if not impossible, to get at the valves without disturbing these units.

Magnetos are, as a rule, placed so that it takes an acrobat to adjust the breaker points. It is usual to put the magneto as near to the dash as possible and also close enough to the exhaust pipe so that if it is necessary to do any work on it while the motor is warm, one will be sure to get burned in a few spots. When the magneto is in this position it is nearly always impossible to see the breaker points clearly with the result that they must be adjusted by the cut-and-try method until the motor runs properly. After each adjustment the wires running to the breaker box must be connected up again, a process that calls for great dexterity because the binding post nuts can often be reached with only two fingers.

Another pleasant job, on a great many cars, is putting in new hose connections, especially the lower one. The ingenious way in which designers can manage to conceal the return joint to the radiator calls forth my admiration. A number of times I have been compelled to loosen up the mud pan and even then it was a difficult feat to put the new hose in place.

The most disagreeable job of all, however, is removing the mud pan. The bolts are inaccessible, the threads small and easily injured and generally there are more or less projecting parts on the mud pan so that it takes a full hour's time to remove and replace this member. I realize that it is difficult to design a mud pan that will be light, will not rattle and at the same time will be easy to remove, yet I believe there is a chance for improvement if manufacturers will only give this matter their attention.

From these examples it would almost seem that the manufacturer and the repair man were in league, as it is the latter than profits by inaccessibility, yet the trouble is due entirely to lack of attention to the small details that make for accessibility and to an unwillingness to make changes in the car construction because of slightly increased manufacturing cost.

New York City. R. F. C.

A Racy Roadster Body for Buick

Editor THE AUTOMOBILE:—Will you please give me some suggestions on remodeling my Buick model 10 runabout into a runabout with semi-inclosed body with raceabout lines.

I want to lower the front seat and put it about a foot back so as to give more leg room. I want to place the tool box in the rear and wish to fit a large gasoline tank.

Any plans, specifications or hints that you can give me will be appreciated.

Pleasantville, Pa. HARRY J. BOTSFORD.

—A sporty roadster of the type you desire is illustrated in Fig. 1. Low seats are fitted and the doors are also low. The steering gear has been slanted to give the car a racy appearance. A large cylindrical gasoline tank is installed just back of the seats and to the rear is a tool box of liberal dimensions. The tires are carried at the rear as indicated. The principal dimensions are given to give an idea as to the size of the different parts.

Dirt in Gasoline Curtails Car Speed

Editor THE AUTOMOBILE:—1—I have a 40 horsepower, 1910 car. This machine runs very well but it misses very much when I run it over 30 miles per hour on high gear and I cannot get it to run over 5 miles per hour on low speed. I changed carbureters. I put new springs on the valves and had them re-ground, and put all new wires on the magneto and tried four different sets of spark plugs. I put new contact points on the magneto.

2—Should the rear wheels be closer together at the bottom?

3—In THE AUTOMOBILE for March 12 you stated that oxygen would increase the power of a motor. Where can I get the pure oxygen?

Kellogg, Minn. J. H.

—1—It is quite probable that your trouble is due to dirt in the gasoline feed pipe, thus causing too small an amount of fuel to be fed to the carbureter. The gasoline tank and the pipe should be thoroughly cleaned out. This advice only holds good, however, providing the magneto and carbureter are in good condition. Having tried two makes of carbureters it hardly seems possible that the difficulty is here, assuming that you understand carbureter adjustment.

The ignition should be looked over to see that there is no place in the high-tension system where the current may jump across when the motor speeds up. The voltage of the magneto increases as the speed mounts up and therefore it may be that the voltage generated when the car is running faster than 30 miles per hour on high gear is sufficient to cause current to leak out at some point. Operate the motor in the dark to see whether any sparks are noticeable, due to the current leaking. Current leakage might also be caused within the magneto by dirt or the spark gap points being too near together.

2—The rear wheels should be the same distance apart at the bottom as at the top.

3—Pure oxygen can be obtained at any drug store.

Five-Cylinder Motor Lacks Balance

Editor THE AUTOMOBILE:—Please tell me what are the mechanical difficulties in the way of a five-cylinder motor?

It seems to me this would be an improvement over the four, providing a constant flow of power to the crankshaft, and still be of lighter weight and less expense than the six-cylinder engine.

New York City. W. C. WISHART.

—The objection to a five-cylinder motor is that it would not balance as well as either the four or the six, although the power impulses would provide a more steady torque than is obtained with the four, and it would be less complicated than the six. Good balance is of more importance than steady torque.

There are two important considerations in the mechanical balancing of a motor, neither of which the five-cylinder type fulfills.

The reciprocating masses, the pistons and upper parts of the connecting rods should be so arranged about the crankshaft that the net result of their reciprocating movement is zero. In other words, the forces in the upward direction should equal those in the downward direction. This condition is satisfied in both the four and six-cylinder motors, and since the balancing of the two is the same only the four will be considered. In the four, two pistons are on the same throw and the other two are 180 degrees from them. When two pistons are traveling upward, two are also traveling downward and the two pairs are traveling at the same speed at all times. Thus their reciprocating motion is balanced. At the same time, if the two outside and the two inside pistons are situated on the same throws, there is no tendency for the motor to be rocked in its frame as would be the case were the pistons on both throws adjacent. On the other hand, with the five-cylinder construction it is impossible to entirely do away with this rocking tendency, because the moments produced by the inertia forces are always unequal.

Leak in Pressure System Due to Valves

Editor THE AUTOMOBILE:—Will you please explain the operation of the fuel system used on the model 42 Oakland. After I have pumped it up to 2 pounds pressure for starting, the pressure will slowly decrease and I will be obliged to use the hand pump again. All the joints in the pressure line have been carefully examined for leaks but the trouble seems to be elsewhere.

Chillicothe, O. M. E. SPROAT.

—The operation of the Oakland 42 fuel system, Fig. 2, is as follows: The gasoline is fed by air pressure from the gasoline tank at the rear to the float chamber of the carbureter. The pressure is supplied either by a hand pump or cam-driven air pump situated on the crankcase, the hand pump being used for starting and the motor-driven one for running.

If the joints are tight, as you say, the decrease in pressure must be due to leaking valves. The discharge valves in the pump should be examined for tightness, the three-way cock below the hand pump should be looked over, and the tank and especially the filler cap should be tested for air-tightness.

Economy of Six and Four About Equal

Editor THE AUTOMOBILE:—Which will give the most miles per gallon of gasoline, a four or six-cylinder motor of the same design, having the same piston displacement and mounted on the same weight chassis?

2—Has the Delco system a magneto in its construction?

3—How much water does the Chalmers light six hold and what is the weight of the car?

Sugar Grove, Ill. H. V. SMITH.

—1—Whether a four or six, everything considered, is more economical is a question. While the efficiency of the six-cyl-

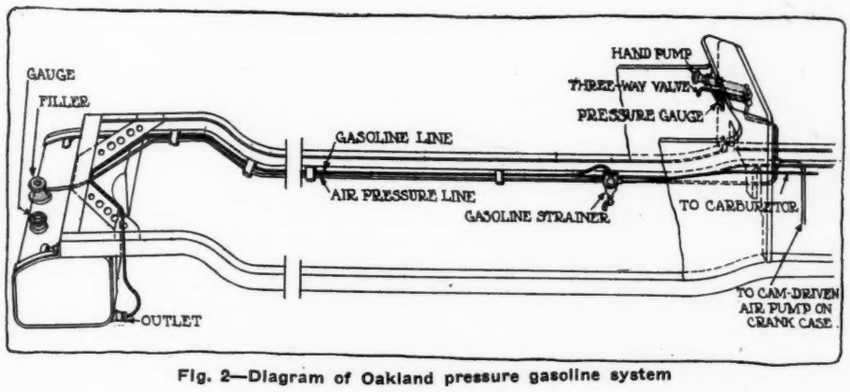


Fig. 2—Diagram of Oakland pressure gasoline system

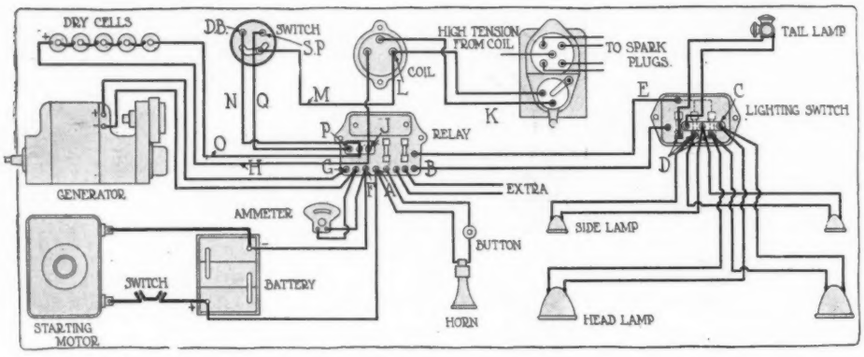


Fig. 3—Diagram of Remy starting, lighting and ignition system used on the Detroiter

inder motor must be slightly lower than the four, due to the fact that there are more reciprocating parts and therefore somewhat greater mechanical losses, and the waterjacket surface is greater and therefore the heat loss to the cooling water must be larger. On the other hand, the torque of the six-cylinder motor is evener and this is an advantage in climbing hills, as sometimes it is possible to pull up a hill on high gear that might require second gear with the four-cylinder motor. In other words it is possible to run on high gear a greater part of the time with the six than with the four and this means more economical operation. Therefore, everything considered, there should be little difference in the economy of the two, but it is impossible without making tests on motors of identical capacity and design to determine whether the six is more economical than the four.

2—A magneto in the strict sense of the word is not used in the Delco system, as current for ignition is taken from the lighting circuit. At low speeds the current comes from the storage battery and at high speeds the current is furnished directly by the electric lighting generator.

3—The Chalmers Light Six holds 8 gallons of water and the weight of this car is 3,230 pounds.

Has Mysterious Knock in Motor

Editor THE AUTOMOBILE:—1—My motor has a bad knock in the front end. I have had the crankshaft micrometered and it seems perfectly round. New piston rings have been put in and all the bearings tightened up, but still the knock is there. The pistons seem to fit snugly enough to keep them from slapping.

I have had the car to the repair shop several times, but the mechanics there have been unable to remedy the trouble.

2—I am going to put in Leak-Proof rings. Is one in each cylinder enough?

Grand Rapids, Mich. SYDNEY GRAVES.

—1—Since various repair men have failed to locate your knock it is safe to assume that the trouble is not caused by any ordinary fault in the mechanism. The knock may be due to one of the crankcase arms being loose in the frame, to a bent cam or crankshaft, to the main or camshaft bearings not being in line, to the wristpins not being perpendicular to the piston walls, or to one of the timing gears being eccentric on their shafts or possibly loose. If the magneto, water or oil pump is driven from the front of the motor then the trouble may be due to the failure of some part in these units.

2—One Leak-Proof ring per cylinder will improve the operation of your motor, but to obtain maximum immunity from gas leakage three rings should be used.

Miss Caused by Current Leakage

Editor THE AUTOMOBILE:—I have a car which is troubled with a miss on high speed, yet it pulls well on low throttle. About 3 months ago I found it to have poor compression and the two brushes in the breaker on the end of the armature shaft ground, or rather tore, to pieces and the end of shaft cut away. I dressed this off. I ground the valves and find that the coil is losing some of the pitch or whatever substance it is impregnated with, yet tried same with another coil of the same make with no better results.

The adjustments and tests I made are as follows:—1—Took up play on distributor spindle; 2—Dressed end of armature shaft; 3—Put in new gauze brushes; 4—Adjusted contact points; 5—Tried to get better results by changing carbureter; 6—Put in four new plugs; 7—Took strainer apart and cleaned; 8—Cleaned carbureter; 9—Adjusted float, dried and shellacked; 10—Adjusted valves. The compression is good on all four cylinders, the valves do not seem to be gummed any, nor wearing on one side, indicating a crooked valve stem. The gasoline line is clear.

The distributer hard rubber case is warped, but by taking up the end play in the distributor spindle I hardly think trouble is there.

The armature shaft has been shortened about 1-16 of an inch and for a period of 3 months has not shown any more signs of wear.

Paola, Kan. R. W. L.

—It would seem that your difficulty is most likely in the magneto or wiring since you have eliminated the possibility of trouble in the coil, carbureter or valve mechanism, etc. It may be that the wiring is defective in some part, allowing a short-circuit or possibly a leakage of current to the car frame without actual contact of the wires with the grounded metal parts.

Another possibility is that the magneto itself is short-circuited or that there is a leakage of current in it. The trouble may be caused by a bare wire, dirt, oil or water. The spark gap points may have been set too near together, when the magneto was taken apart with the result that the current finds an easier path across these points at high speed than is afforded across the plug points.

Remy, Starting, Lighting and Ignition System

Editor THE AUTOMOBILE:—May I ask you to give the plan of the wiring of the Remy starting, lighting and ignition system as applied to the Detroiter car?

Alma, Mich. E. W. LAKE.

—The Remy system is illustrated in Fig. 3. The ignition is maintained by either the dry cells, storage battery or the generator, one end of which contains the breaker and distributer for the ignition system. When the generator is running faster than 300 revolutions per minute it supplies current directly to the lamps, while below this speed it is automatically cut out of circuit by the cutout relay. When this happens the lamps are fed from the storage battery.

The starting motor circuit is simple, consisting merely of two wires from the battery connected by a wedge switch.

When the lamps are on the storage battery, and the generator is cut out, the current flows from the plus terminal of the battery to the binding post, A, on the cutout relay, and from thence to B through a concealed wire. From B the current flows to the bus bar, C, on the lighting switch. From here it passes out to the lamps and back again to one of the binding posts, D, and then through a fuse to the wire, E. From E the current runs through a concealed wire to the terminal, F, and from there back to the storage battery.

When the cutout relay is closed, the generator charges the battery and supplies current to the lights. The path of the current to the battery is from the plus terminal on the generator, to the binding post, G, and then to A through

a concealed wire, and then to the plus terminal of the battery. From the negative binding post the current runs to terminal, F, through the ammeter and from thence back to the generator. Since the generator leads connect to the points, A and F, the same as the storage-battery wires do, the same wiring is used for the lights when running on the generator as when running on the storage battery.

For ignition, the dry cells are used only for starting, while the battery or generator is for running. The current flows from the dry cells out through wire, H, to the point, J, on the relay, and then up through the low-tension winding of the coil, out through wire, K, through the breaker box on the magneto, and then back through wire, L and M, to the switch. It crosses over the switch points and returns to the dry cells through N and O.

When the current is supplied by the storage battery or the generator it flows from the point, A, to J and from there the path is the same as on the dry cells all the way to the switch. From the switch the current flows through the wire, Q, to the relay, where it connects with F.

Magnets Can Not Be Charged by A. C.

Editor THE AUTOMOBILE:—1—How could I recharge magnets from magnetos using A. C. current 110-volt 60 cycles?

2—What size wire should I use and how much? From what pole should I start to wind and in what direction?

Spencer, Iowa. A SUBSCRIBER.

1—Magnets cannot be charged by means of alternating current, unless some means is employed to convert it into direct. It is impossible to charge magnets with alternating current because electro-magnets are required that supply a field that is unchanging in its direction, and if alternating current were used the field would reverse its polarity with every wave of the current.

By using a rectifier to change the current to direct you might use the apparatus that was described in detail in THE AUTOMOBILE for March 26.

2—These questions are answered in the March 26 issue.

Purpose of Valve Lug on Tube

Editor THE AUTOMOBILE:—1—It occurs to me that it would be profitable for you to have a discussion in your columns on the proper method of installing the clamp plate which is found at the base of the valve stem on the inner tube. There seems to be a variety of opinions as to the value of this plate and a general lack of understanding as to its function.

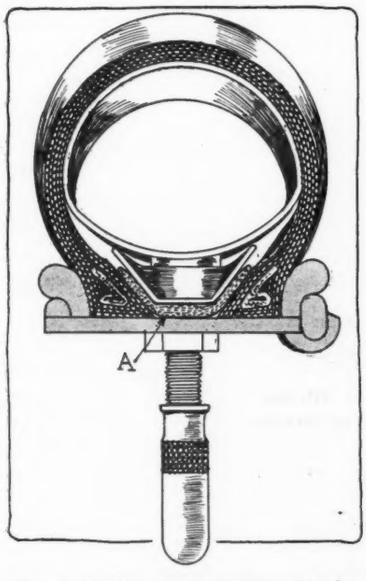


Fig. 4—Section through tire, showing valve lug and protective strip A

There are several shapes and sizes of these plates furnished by the different tire manufacturers and I have thus far been unable to obtain definite information as to how this plate should be installed when the tube is placed in the casing. Should its greatest length be across the tire or lengthwise?

2—The United States tires have a protection strip between the tube and the rim of the wheel. Should this plate be between the tube and the protective strip or between the strip and the rim? In what tires, if any, is it advisable to omit this plate? I have had tubes fall, apparently, because this plate was not properly installed, and, therefore, would like your opinion.

New York City, N. Y. F. GALE.

—The method of installing the clamp plate or lug is indicated in Fig. 4, its greatest length being lengthwise of the tire. The function of this lug is to protect the tube at the point at which the valve is attached. It also aids in holding the casing in place on the rim.

After the shoe has been put on and the rim put in position the lug should be screwed down tight by turning up on the hexagonal nut on the outside of the rim, or felloe.

2—The protection strip should be placed between the lug and the rim as indicated at A. This strip is to protect the tube and hold it away from the rim. The protection it affords is small, however, and it can be left off of any tire without appreciable injury to the tube.

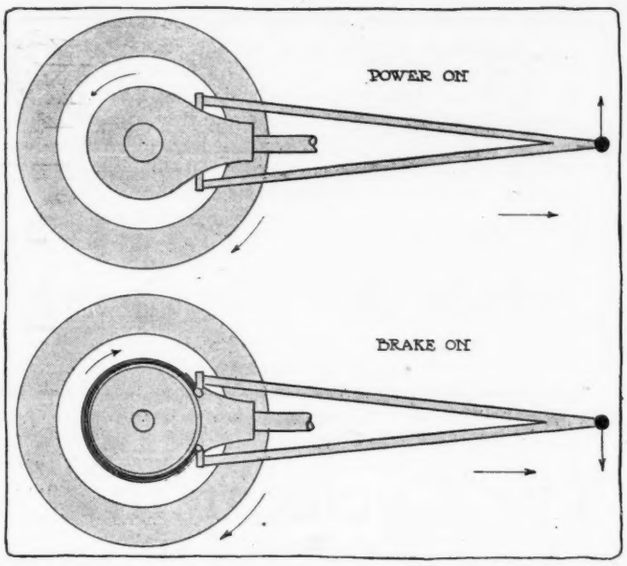


Fig. 5—Diagram showing direction of thrust on torsion rod when the car is driven forward and when the brakes are applied

Upward Thrust on Torsion Rod

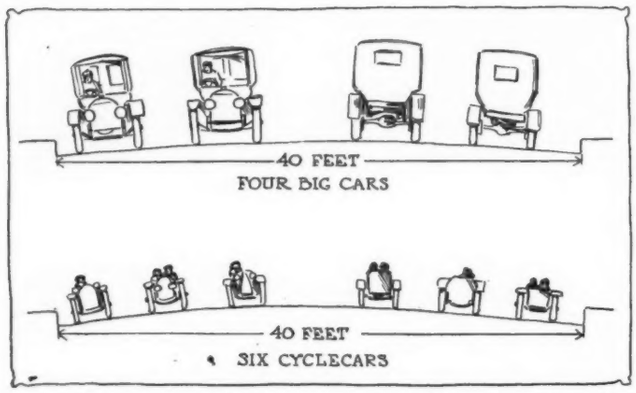
Editor THE AUTOMOBILE:—1—When the propelling power is applied in an automobile having a torsion rod, is the tendency of the front end of the rod to move up or down?

2—When the brakes are applied to the wheels, with the power off, which way would the torsion rod tend to move?

Watertown, Wis. SUBSCRIBER.

—1—When the car is being driven forward there is a tendency for the torsion rod to move up. This is due to the reaction of the force transmitted by the motor to the wheels. In other words, the rotation of the wheels in one direction produces a reaction that tends to rotate the axle in the other direction. Therefore since the wheels are rotating in a clockwise direction according to the upper diagram, Fig. 5 the axle tries to move in the opposite direction, thus producing an upward force on the torsion rod, whose function is to resist this stress. The direction of the different forces are indicated by arrows.

2—When the brakes are applied to the car the reaction on the end of the torsion rod is just the opposite to what it is when the power is applied. Therefore, when the car is moving forward, a downward stress will be imposed on the end of the torsion rod. The direction of the forces is illustrated in the lower diagram. When the brake grips the drum it tends to drag the axle housing around with it, and this tends to pull the torsion rod down.



On streets where but four cars run abreast two lines of moving traffic could be added when cyclecars are used

The Cyclecar in City Traffic

Takes Up But Half the Space Taken by a Big Car —Moves More Quickly

By William B. Stout

WITH the regulation of traffic an increasingly serious problem, the coming of the cyclecar as a serious transportation vehicle, should be welcomed by every community as a very promising basis of a new street efficiency; and large communities, instead of looking askance at the new tiny, but efficient vehicles, should welcome them and give every encouragement to their development and more general adoption.

The cyclecar in its present form takes up but half the street space of a big car, moves quicker, on account of its more rapid acceleration and stopping ability, can thread traffic better on account of its narrow width and handy light weight, and for the rider can offer equal comfort and weather protection with all these other advantages, at one third the running cost or less. The latter items interest the buyers of cyclecars, the former items should interest municipalities.

In streets where now but four lines of traffic can ply, with cyclecar traffic six cyclecars could run abreast with equal safety and speed. Where now the average car of 121-inch wheelbase and 56-inch tread covers 71.5 square feet of street room when running or standing, the cyclecar takes up but 35 square feet, less than one-half.

1,500 Cars Standing

In the loop district of Chicago it is estimated that there are 1,500 cars drawn up at curbs during business hours, standing idle and taking up street space. This number of cars occupies more space than the mere dimensions of the cars, the width of the space used being 8 feet wide and 15 feet long average, or 120 square feet per car, allowing a foot of clearance on every side. This makes 180,000 square feet occupied by standing cars in the crowded loop district of Chicago in the worst traffic hours, equal to .8 mile of street area made useless so far as movement of traffic is concerned. With the cyclecar, allowing space on every side in the same way, each car would take up 66 square feet of space, the 1,500 cars taking up but .43 mile of street space.

This figure would not be reached practically as not all the cars in the district at that time are limited to two passengers, though about 80 per cent. of the cars used for shopping carry one or two persons only.

If this saving of space is analyzed it will be found that the advantage of a narrowed blockade at the curb would in the average street allow two new lines of traffic to move, if all vehicles were narrow tread, but one more line at least of present width cars.

The convenience of the new vehicles in traffic will be another advantage. Most of the little cars can start with astonishing rapidity, and thus get away quicker than the average big car. On the road they show new space-saving possibilities.

Economizing Clearance Space

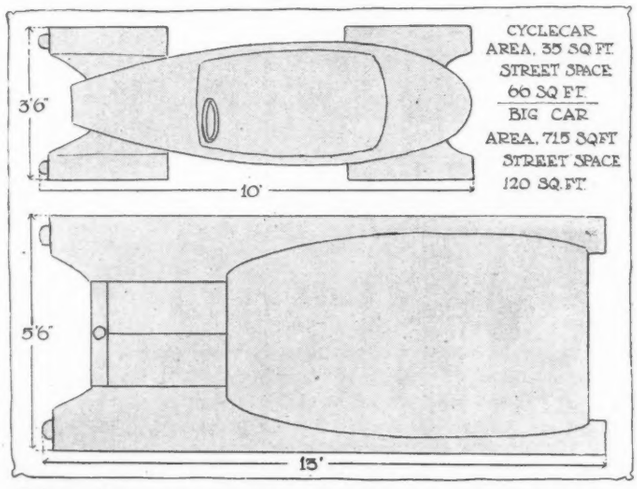
London allows drivers to leave 6 inches of space between the hubs of cars passing. To leave more is to brand yourself a poor driver, and London has fewer street accidents than America, in proportion. The American driver does not observe the rules of the road with as much religion as the English driver and hence to try to run as close as this would be to invite trouble, even if it were the other fellow's fault. The average car in Chicago passes with 24 to 40 inches between hubs.

In the cyclecar one is low, and in line with the widest part of the car—the front fenders. The driver can see where his car is, every part of it, and hence ordinarily drives closer to vehicles than a big car, knowing that if they turn suddenly he can turn quicker than they and hence his risk is small so long as the car does not run him into a curb or street island. Cyclecars passing often leave but the 6 inches between and do it without thinking that they are doing careful driving.

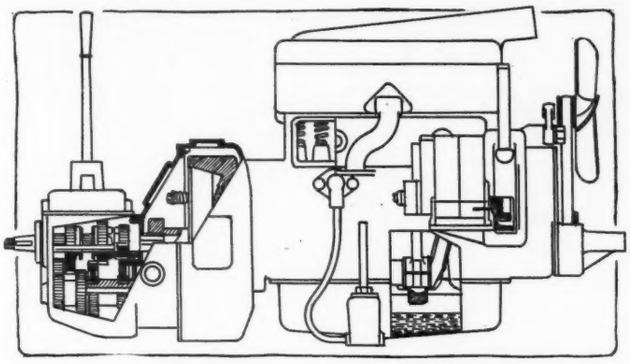
Quick in Traffic

As to speed, the cyclecar makes better traffic time than big cars on account of its narrowness and accelerative powers, and is only excelled by the motorcycle. The writer, in a 9-mile trip through the loop district of Chicago, and, on through the boulevard system passes on the average about nine cars on the trip, not by speeding but by being able to get through places where the big cars are held up, and on account of the previously mentioned quick pick-up.

Between the ability to move quickly and the small amount of room taken the cyclecar is certainly an opportunity for the city and the business man to whom time is valuable. Cyclecars will be built with such refinement and quietness and beauty that no business man need lose his dignity to drive one to work in the morning, and he can make the office in less time, with as great a degree of cleanliness and in better comfort than in his big car.



Comparative space occupied by cyclecar and average big car, a foot of clearance being allowed around each



Farmer unit power plant for cyclecars

Two Cyclecars —A Cyclecar Motor

Robie Cyclecar Has Unique Streamline Body—Disk Wheels—V-Type Motor

ANOTHER addition to the growing list of cyclecars is the Robie, a tandem seater, hailing from Chicago. It is featured by a unique streamline body design, disk wheels, and windshield and fenders so formed that they may be said to be a unit with the body construction. Lighting is by means of electricity which is supplied by a small, silent-chain-driven generator. The car has a V-motor, friction transmission, wheelbase of 108 inches, a tread of 36 inches and weighs, completely equipped, 540 pounds.

The power plant comprises two air-cooled V-cylinders with bore and stroke of 3.5 by 4.09 inches. The cylinders are set at 90 degrees and project through the sides of the hood, thus insuring good cooling. Ignition is by the Atwater Kent system while lubrication is by force-feed. The motor is cranked by means of a mechanical starter, the handle for operating the starter being within reach of the driver.

The steering wheel is 15 inches in diameter and operates a rack and pinion gear. The steering rods are so arranged that they compensate for the rise and fall of the front springs. The brake pedal operates internal expanding brakes on the rear wheels.

The frame is pressed steel rigidly braced by cross-members and supported by a double transverse spring in front, which takes the place of the axle, and cantilever springs in the rear. Thus a three-point suspension is obtained.

Cup and cone ball bearings are used in the front wheels and annular ball bearings in the rear. The tires are 28 by 3.

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Malcom Cyclecar to Make 65 M. P. H.

A CAR built along approved lines of large car construction is the Malcom, manufactured by the Malcom Jones Cyclecar Co., Detroit, Mich. It is a tandem seater with four-cylinder motor, sliding gearset, and capable of a speed of 65 miles per hour, it is said. The price with complete equipment, including mechanical starter, is $425.

The motor is a four-cylinder, four-cycle, water-cooled design, with cylinders cast in a block. The bore is 2.5 inches, the stroke 4 inches, and it is rated at 16 horsepower. Lubrication is by plunger pump and splash. Ignition is by the Atwater Kent system and the carbureter is a Mayer make.

A simple cone clutch with pick-up springs under the leather transmits the power to a three-speed and reverse sliding gearset. The gears are made from double heat-treated and oil-hardened steel. The primary shaft is splined, and is supported on ball-bearings.

Final drive is by shaft to bevel gears on the rear axle. A differential is employed. Internal expanding brakes are used. A drop-forged front axle is fitted and supports the frame on an inverted semi-elliptic spring set transversely. Full cantilever springs with inverted leaves to absorb the rebound shocks are found in the rear.

Wire wheels, 28 by 3 inches, and fitted with cup and cone ball-bearings, annular, and Hyatt rollers.

Steering is by means of a rack and pinion gear, with special gearing offsetting the column around the motor.

The equipment includes windshield, electric lighting system with storage battery, electric horn, tools, tire repair outfit, pump, and mechanical starter. A one-man top and side curtains is $15 extra, and a speedometer $12.

The wheelbase is 106 inches, the tread 36, the clearance 9, and the weight 630 pounds.

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Farmer Motor—A Unit Power Plant Design

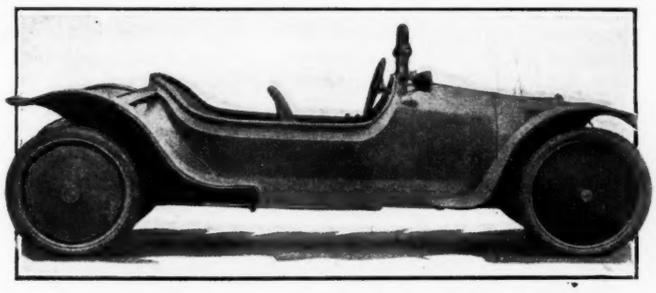
A CYCLECAR motor with four L-head cylinders in unit with a three-speed sliding gearset has recently been brought out by the Farmer Mfg. Co., Detroit, Mich. The cylinders are cast in a block, are water-cooled and measure 2.75 by 4 inches, the rating being 18 horsepower. Thermo-syphon cooling is employed.

The motor is a well-worked out, neat design following closely on the lines of big car practice. The cylinder casting is clean cut and free from piping, the intake and exhaust manifolds are integral with the cylinder casting while the outlet water header is a unit with the cylinder head which is detachable.

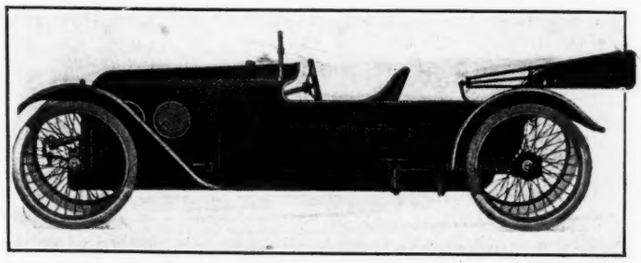
The valves are inclosed and are adjustable, and are situated on the right side as is also the carbureter, magneto and oil pump. Lubrication is by splash and circulation is maintained by the pump which is located at the base of the oil reservoir which forms the bottom of the crankcase.

A cone clutch that is fully inclosed by a bell-shaped housing formed by the rear of the crankcase is employed. Engagement is maintained by several springs arranged around clutch spider.

The gearset case is bolted to the flywheel housing. Three speeds forward and one reverse are provided, and the change gear lever is mounted directly on top of the case.



Robie cyclecar with streamline body and disk wheels



Malcom cyclecar with four-cylinder motor and sliding gearset

The Engineering Digest

Harmonic and Other Vibrations of Shafts the Most Fundamental Cause of Worn Bearings and Gear Noises with High-Speed Motors

OSCILLATING BEARINGS AMONG REMEDIES TO BE CONSIDERED

EXCEPTIONALLY, the so-called periodic or harmonic vibrations of motorshafts and of drive shafts have been known to cause trouble in American automobiles, especially in trial models. Mysterious noises have come and gone, as certain motor speeds were reached and exceeded; bearings have worn out with astonishing rapidity; aluminum casings have cracked without apparent cause. As a rule, however, periodic vibration has been looked upon as a mechanical joke, practically negligible though scientifically possible. In point of fact, the phenomenon is serious when it occurs, but usually, if the conditions causing it are understood, it can be obviated by simple expedients in design, such as shortening and thickening of a shaft, reduction of the rotated mass or of the centrifugal forces and increasing the number of bearings. It may be responsible for the fact that certain construction features which look attractive never have become widely adopted. Among these are ball-bearings for the crankshaft and very long drive-shafts running from an obliquely mounted motor to the rear axle. Some of the difficulties which makers of six-cylinder motors have had to overcome can also be traced to the same cause.

With the greatly increased motor speed, running up well toward 3,000 revolutions per minute, even where a long stroke is used, which is now commonly adopted in Europe for light cars, European builders are now experiencing the evils of periodic vibrations more than formerly and are compelled to take precautions against them. The demand for silence in car operation has brought to attention even such minor instances of periodic vibration which before passed unnoticed because the noise they caused was ascribed to other factors. The removal of these other factors—as where gears were replaced by silent chains—caused a search for the cause of the noise which nevertheless continued to be heard under certain conditions.

In so far as similar motors and similar construction are or may be adopted more or less widely in this country, there may be similar need of looking out for and forestalling periodic vibration in all its manifestations.

Cyclecars Specially Menaced

Even the heavy propeller shafts of ocean liners are subject to vibrations and have been known to break from their effect when it came to pass that the power in rotating the shaft helped to continue and amplify the oscillations caused by a shock instead of counteracting them. This coincidence occurs if the number of oscillations per minute for which a shaft is adapted is duplicated in the number of revolutions imparted to it. As the laws ruling this matter are evidently the same which rule the vibrations of musical chords and sounding boards, it may be assumed that a number of revolutions which is just twice as large as the number of oscillations natural to the shaft may have an even stronger effect and that a number of revolutions just one-half of this number also may have some effect, though a more subdued one.

The object of the constructor must be to design the shaft and its bearings in such manner that the velocity number of its natural vibrations becomes much higher than the number of revolutions at which it may be driven and also so that this velocity number is not an arithmetical multiple of any commonly employed driving-speed. The last requirement is probably best met by so dividing the length of the shaft by means of its bearings that the vibrations of one part do not coincide in speed with those of another part, as by this provision the vibrations of one portion will counteract those of another, by virtue of the continuity of the metal in the shaft, and all simple arithmetical relations to the driving-speed, whatever the latter may be, will be smothered in complications.

It may be practicable to ascertain the vibratory properties of a shaft, or of any other part which is suspected of transmitting and amplifying noises, by means of a musical test, every musical note having a known vibration period, which in the case of the ordinary tuning fork, for example, corresponds to 4,000 vibrations per minute. No such method of testing has so far been developed, however.

An automobile engineer, Th. Lehmbeck, of Berlin, presents a study on this subject, some parts of which may be of timely interest, especially as these vibrations probably threaten the successful production of cyclecars more than that of any other type of vehicle.

Vibration Test Figures

According to Stodola, in his work on the steam turbine, N_h, being the harmonic or critical number of revolutions of a freely suspended shaft, can be calculated from the formula

$$N_h = \frac{r \times 10^4}{L^2 \times 1.633}$$

in which r is the radius of the shaft in centimeters and L one-half the length of a shaft in centimeters, the shaft being mounted in bearings at both its ends. Mr. Lehmbeck has made a series of practical tests by which the correctness of this formula was proved, he says. But it is only applicable when the bearings are very close to the ends of the shaft. Projecting shaft ends, even if quite short, influence the vibration period greatly, and the vibrations are much amplified if the projection or projections are longer. In many cases this consideration should lead to a redesigning of crankshafts in which a considerable length of free end extends from the front bearing in the crankcase toward the starting-crank attachment.

Tests with carefully turned and ground shafts of 30 millimeters diameter gave the following results: A shaft 1600 millimeters long and mounted in ball-bearings at both ends began suddenly to vibrate like a piano chord at a speed of 1500 revolutions per minute, and the amplitude of the oscillations was 8 millimeters. At higher speeds the vibration ceased at once. When the shaft was cut down to a length of 1,400 millimeters, the vibrations did not begin till the speed was 2,050 revolutions per minute, and the stroke of the vibrations was 7 millimeters. At a length of 1,200 millimeters, the critical speed was found to be 2,500 revolutions and the amplitude was 6.5 millimeters.

Figures corresponding to these are represented in many of the drive-shafts of automobiles and in the speeds at which

they are rotated. Their vibrations will be transmitted to the bevel pinion beyond the rear bearing and from its teeth to the bevel crown, and the force of the oscillating movement of the gear teeth will be multiplied by the transmission from a long lever arm to a very short one. This great force will soon have its effect upon the ball-bearings, so that in the long run it will make no difference whether the bevel pinion is mounted between two ball-bearings or not. The force will loosen up the bearings at the times when the critical speed is in action, and thereafter the gear will be noisy even at other speeds. In Adler cars the shaft is divided and a bearing provided at the middle to obviate these results. Another method consists in lining the torsion tube, if the shaft rotates within this member, with a bearing of *lignum vitæ* about 200 millimeters long and a bore giving a play of about 1 millimeter with the shaft.

It is evident that vibrations can be transmitted from one shaft to another through the teeth of gears mounted upon the two shafts. This is what occurs when a horrible noise is suddenly heard from the camgear of a motor which is being limbered up on a brake test stand. The large gearwheel on the camshaft is the evil-doer. After trying all other expedients to avoid this noise the constructor resorts perhaps at last to a silent-chain drive without complete success, while he might have saved himself much trouble and many changes if his attention had been directed from the first to the possibilities of noise arising from vibrations of the crankshaft transmitted to the camshaft through the camgears. In this respect the irregularities in the resistance to the rotation of the camshaft undoubtedly also play a considerable part. [The author here seems to have in mind the Bugatti construction by which the camshaft is braked during the intervals when the cams are not working in order to equalize the resistance to its rotation.—ED.]

Vibration and Noise of Gears

To avoid the vibrations of crankshafts and camshafts, the designs and methods of mounting crankshafts which were suitable with the motor speeds of a few years ago are no longer sufficient. The author mentions that he has made tests at various automobile factories in Germany which proved to the satisfaction of the engineers in charge that gear noises in reality in very many instances could be explained only by the vibrations which were caused or aggravated by the concurrence of critical speeds with other factors. By the rotation of a crankshaft centrifugal forces arise whose magnitude depends upon the mass of material in the cranked portions, the radius of the crankarm and the shaft speed. The effects of inertia are so strong that, in the case of an ordinary crankshaft with two end-bearings and one central bearing, strong vibrations are observed when the shaft is tried out separately on a balancing-machine at speeds as low as 400 to 600 revolutions, even if the diameter of the shaft is greater than normal. In practice, however, these vibrations do not occur in the same manner, as the work of the motor and the action of the flywheel neutralize them. If the flywheel itself is of suitable diameter and has been well balanced on the balancing-machine, its regulating effect is predominating over the minor factors which left to themselves cause violent vibration. A projecting front end upon the shaft remains practically the chief disturbing element, and it can easily be avoided by cutting the shaft off short in front and connecting the starting-crank accordingly. It is noticed in this connection that the vibrations recorded on a balancing machine for a shaft with a front projection are much greater at the front than at the flywheel end, even though the flywheel is not mounted, and the same is true in actual motor practice, and has led to the adoption in certain automobile motors of a central flywheel or of a light flywheel at each end.

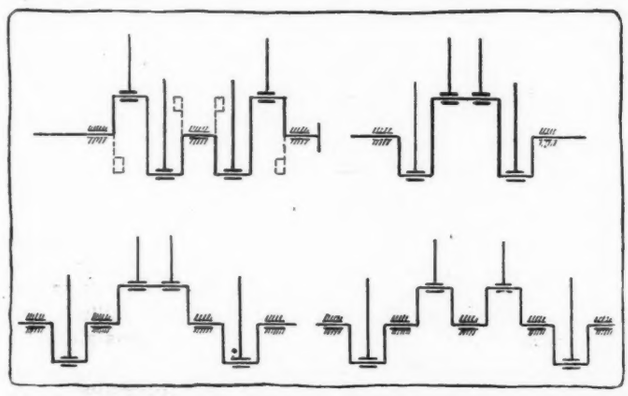


Fig. 1—Four types of crankshaft, referred to in text. Dotted lines indicate author's chief remedy for vibrations

Counterweights Indispensable

On account of the unequal division of the masses the only manner in which flexions of the ordinary motorshaft, with three bearings and a double-length crankarm between the middle bearing and each of the end-bearings, can be avoided is by equalizing the centrifugal forces by whose action vibrations are started, not only for the whole shaft but for each crankarm by means of suitable counterweights oppositely to each of the single-length crankarms, but this construction is of course much more expensive than the ordinary construction in which no consideration is given to the minor causes of vibrations and the unequal wear of bearings which results from them. It is well known, however, that the front and middle bearings in the past have worn out, as a rule, much more rapidly than those nearer to the flywheel, despite the weight of the latter. In the case of the short two-bearing shaft with double central crankpin, now used so widely for block castings, it is clear that the vibrations are likely to be pronounced even if the dimensions of the shaft are larger than ordinary, because the additional weight, which means greater rigidity, also means an addition to the swinging masses the moment vibration is started through the action of critical speed. With this type of shaft, if tests are not made and precautions taken to forestall harmonic vibration completely, the two bearings should be mounted so as to allow the movement of a universal for the bearings themselves, as otherwise any vibration of the shaft must necessarily wear them out conically.

Much better for modern motors than the two-bearing shaft is the type with four bearings, two of which separate cranks 1 and 4 from cranks 2 and 3, the latter having a double-length pin in common. If this type is carefully balanced it should meet modern requirements well enough. Still better, however, is the five-bearing shaft, which is used, for example, for Knight motors and for Benz aviation motors. Despite their advantages, it is still necessary that each crank should be balanced separately by counterweights. Unless this is done the bearings are always worn out prematurely by the vibrations.

Standardizing Quiet Shaft Types

It would be highly desirable if the type of crankshaft by which these vibrations may be avoided were determined for each type of motor at some reliable public testing institution, as the balancing-machine commonly employed in automobile factories tells only that the balancing is imperfect, but not just where the faults lie and how they should be corrected. A balancing-machine which has been described in *The Autocar* and is used in England does, however, all that is wanted, and the data obtained by means of it confirm the contention that counterweights for each crankpin are absolutely required, at least so long as oscillating ball-bearings for the crankshaft are not adopted. [A cursory description is here given of the British balancing-machine.]

That the complete avoidance of vibrations through suitable design is much preferable to the mere makeshift of saving the bearings by making them participate in the vibrations instead of resisting them, follows from the fact that everything mounted rigidly upon a vibrating shaft must share in the vibratory movements. The part mostly in question in this respect is the small gearwheel from which the camshaft is driven. So long as the bearings are intact this gear will run fairly well and silently, but no sooner has the motor been limbered up before it gets noisy and transmits vibrations to the camshaft, and with the irregularity of the work of the camshaft as an additional disturbing factor the gear teeth are worn unevenly and the clatter becomes worse and worse.

Chain Drive Mere Palliative

For these reasons most constructors, without going more deeply into the subject, have taken to chain-drive instead of gears, and have not troubled themselves to ascertain first the experiences already on record with regard to the chains. If it had been understood that the noise is due in the first place to vibrations of the crankshaft, and that these are transmitted to the chain also, it might have been decided to eliminate the vibrations before undertaking to introduce a new construction feature.—From *Auto-Technik*, March 14.

Compressed-Air Motor-Starters in France Struggling To Win

WHETHER French builders and motorists are looking forward to having electric ignition and lighting of their cars and at the same time having a compressed-air equipment for starting the motor, inflating tires, changing gears and cleaning the vehicle, is a pertinent question arising when it is noticed that electric lighting is very popular with them but that air is greatly preferred for starting purposes. Mechanical starters, on the other hand, are also favorably considered, and it may thus be the prevailing idea that there will be a sufficient number of motorists who will continue to use oil lamps or acetylene lamps to afford a market for air equipments, and that a complete electrification can only be expected for the largest cars, for which the weight and the cost of a powerful electric outfit will not be excessive.

Probably, however, the situation is best accounted for from the fact that compressed-air starters had been creditably developed in France before electric lighting became an assured possibility through the improvements of tungsten filaments.

To clear the ideas, a comparison of a mixed equipment, comprising both electricity and compressed air, with one

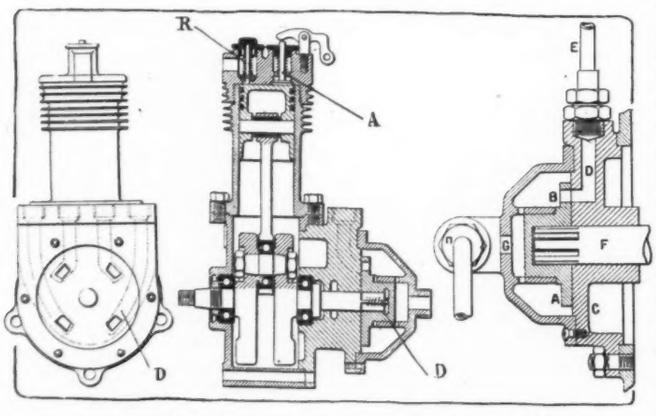


Fig. 2—Letombe compressor. Fig. 3—Distributer

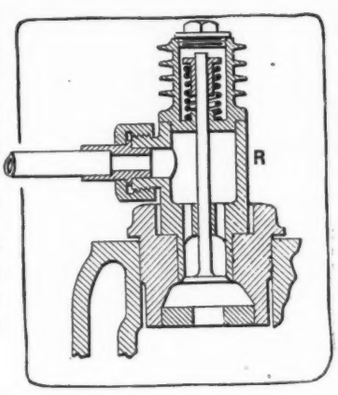


Fig. 4—Admission valve

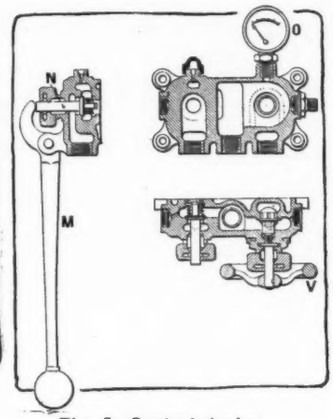


Fig. 5—Control device

entirely electric, giving details on the cost, the weight, the incumbrance and the conveniences obtained in both cases, would seem to be in order, but none has so far appeared in the automobile press of any country, all matters pertaining to the subject being still in such rapid development that a comparison could be little more than a forecast.

The compressed-air system for motor starters which has won the widest recognition is that devised by Professor Letombe, of the Central College for Arts and Manufacture. The system consists in sending charges of compressed air to the motor cylinders, the charges being timed to arrive in each cylinder at the beginning of the power stroke. The pressure applied to the piston in the first cylinder must thus be sufficient to turn the motor over and impart some momentum to the shaft, to which the successive charges to the second, third and fourth cylinders add their share, until the speed of the shaft is sufficient to cause a proper explosive mixture to be drawn in and ignited, whereafter the compressed-air feed is automatically cut out.

The installation comprises an air tank in which the pressure is maintained by a small compressor actuated from the motor when the latter is running. By means of a control apparatus operated by hand the air is released from this tank and is sent to a distributer which directs it to one of the cylinders through an automatic air valve.

The intake valve A of the compressor, Fig. 2, can be kept open by means of the rocker arm shown in the cut, so as to interrupt the pumping as soon as the maximum pressure is reached in the tank. R is the discharge valve to the tank. The compressor is shown built into one piece with the distributer. The tank is ordinarily disposed of under the chassis, where it appears as a counterpart to the muffler.

The distributer, which is shown separately in Fig. 3, has a fixed plate C in which there are four or six ports, accordingly as the device is to work with four or six motor cylinders, and each port is connected by a bore in the plate with a tubular conduit leading to an admission valve on top of the corresponding motor cylinder. In front of the plate turns a circular rotary slide-valve disk A with one aperture B. It is mounted upon the fluted end of shaft F which in this case is a prolongation of the compressor shaft and is free to slide a short distance upon this shaft. When air is admitted from the tank through tube *n* and port G, it presses the disk against plate C and thereby secures the tightness of the joints formed successively between the aperture B and each of the ports in plate C. As soon as the motor is started and the air ceases to arrive, the rubbing of the valve disk against plate C separates it from the latter, and no further wear of the disk takes place till it is used again.

[This description does not explain by what means registry is secured, when the air is first admitted, between the aperture B and one of the ports leading to the cylinders.

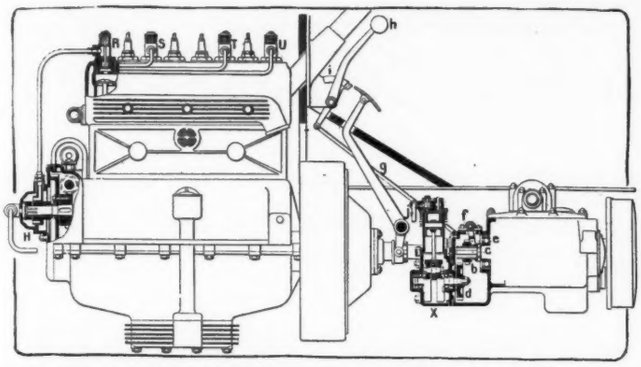


Fig. 6—Installation as preferred when provided for in design of car

Possibly the natural balance of a four-cylinder motor—causing it to come to rest, as a rule, with the cranks in the horizontal plane—is relied upon to effect the registering, and the balance of the compressor may be arranged with the same end in view. Likewise, the means for making the first air-charge reach a motor cylinder which is ready for a power stroke are not accounted for, except on the plan that the right port will naturally register with hole B, and a certain element of chance in the starting would seem to be accepted, unless the description is fragmentary on this very essential point. In the form of installation shown in Fig. 6, and referred to later, the slide valve disk is mounted upon the end of the camshaft, while the compressor is worked from the change-gear box, but here, too, no absolute security for registry is provided.—ED.]

The admission valve to each cylinder is screwed into the cylinder head like a spark plug. It is a simple spring-closing valve, as shown in Fig. 4. According to the description it is here shown as inserted in the exhaust valve box.

The control apparatus, Fig. 5, consists of a valve N operated by the hand-lever M to send compressed air from the tank to the distributer, a pressure gauge O and a stopcock V barring the entrance of air in the gauge to secure complete air-tightness during long periods of rest for the car or the device. An attachment is provided with a view to the use of the air for the inflation of tires and other subsidiary purposes.

When the compressor and the distributer are worked from the same shaft, as is most convenient if the device is applied to old cars, it is necessary to make the compressor turn at half of the motor speed, in order to have the distributer properly timed. Either a reduction gear from the crankshaft is therefore used or the compressor is mounted upon the end of the camshaft. The controller is of course always mounted upon the dashboard. But by this arrangement the compressor must be left working idly when the tank is full, though with the suction valve held open, as before mentioned. [Apparently the driver has to watch the gauge to determine the time for locking the suction valve in its open position, although, at the cost of a little more complication, the air pressure itself might be enlisted for this purpose.]

Where the installation is provided for in the design of the car, as in the case illustrated in Fig. 6, only the distributer H is in front of the motor, mounted upon the camshaft end, the compressor X is mounted in front of the gearbox where it may be operated at any suitable speed by means of the gears *bd*. The gear connection can then be thrown in and out by shifting-fork *e* and the operating levers and rods *h, i, g, f*. It is under the same circumstances that the admission valves, R, S, T, U, can be built into the exhaust valve boxes.

The total Letombe installation, it is claimed, comes within a weight of 15 kilograms, while that of an electric installation capable of taking care of starting as well as of lighting weighs from 75 to 150 kilograms. It is also said to be superior in the matter of silence, owing to the absence of gears running at high speed.—From *La Vie Automobile*, March 14.

[Another system of compressed-air motor-starter, used for Delaunay-Belleville cars, depends upon a four-cylinder compressed-air motor placed in front of the gasoline motor of the car for starting the latter, this complication, with the additional weight and cost it implies, being accepted in preference to the uncertainty which still must attach to the Letombe system if the description given above is taken as reasonably complete. It may here be noted that the French press cannot dwell on unfavorable features without incurring heavy responsibilities.—ED.]

A Mechanical Starter Device

Considerable ingenuity is developed in devising mechanical elements by which the driver may be relieved of going to the front of his car in order to turn the motor over, but usually the physical effort required for operating them is no more agreeable than that wanted for the turning of a starting crank, while the continuity of the movement is much inferior. One of the latest of these contrivances is the Bell starter, in which the most characteristic feature is that the teeth of a small pinion, as well as those of a larger gear wheel upon which it acts, are inclined, somewhat like the teeth of ratchet wheels; to the effect that, when they are engaged on the steep sides of the teeth, the reaction is tangential and transmits a rotary movement from the small to the large wheel, while with the engagement on the inclined side, the large wheel driving, the reaction becomes largely radial and serves to throw the small wheel out of engagement with the large one. In other words, the small wheel can be held in driving connection by a small physical effort while the muscular force is being applied to the rotation of it, and yet, when the motor starts and the large wheel takes the lead, no violence is done to the rotary driving apparatus.

An application of this principle is shown in Fig. 7. The pinion B is mounted in a pivoted frame and is held out of engagement with the wheel A by the spring *b*. When a start is wanted, the handle E is grasped and twisted, by which motion the cable C serves to turn the frame of B toward A, effecting an engagement. Then the driver pulls the handle toward himself, thereby actuating the cable D, which is enrolled upon the pulley upon which pinion B is secured, and rotating this pinion. The pulling-back of the handle releases its squared base from engagement with cable C, so that the mesh of the wheels is now secured only by the inclination of the teeth and the pull on cable D. When the hold is released, disengagement therefore takes place. A spiral spring in the pulley of B tautens the cable D again. In case of backfiring, the handle simply slips from the driver's grasp and spring *b* unmeshes the pinion.—From *Omnia*, February 28.

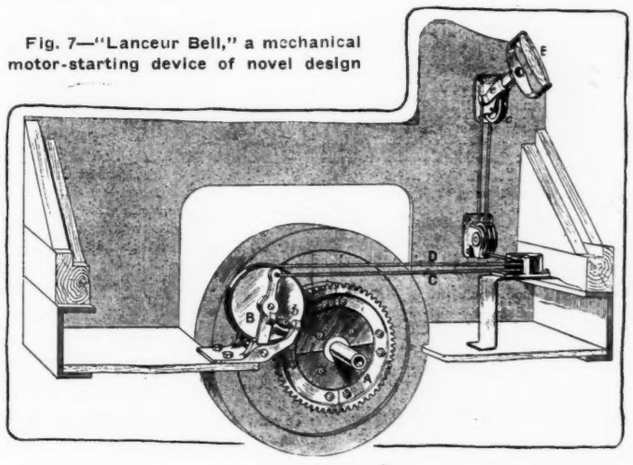


Fig. 7—"Lanceur Bell," a mechanical motor-starting device of novel design

Steam Car with Complete Condensation

No Steam Visible at Speeds Up to 70 Miles An Hour — Geared 1 to 1, 25-Horsepower Engine Shows Remarkable Acceleration

AS a result of 9 years' experimenting, Abner Doble, of Waltham, Mass., has developed a steam automobile which he claims entirely does away with the great disadvantage that the steam car has heretofore worked against; that is, a limited mileage on water. The car uses kerosene as a fuel, and secures 10 miles to the gallon.

The roadster car which is at present being used for testing is capable of developing a speed of 75 miles an hour on a 25-horsepower double-acting, two-cylinder, single-expansion steam engine. The 4 by 6 engine is geared at 61 to 60 on the roadster model and on this ratio is capable of attaining a speed of 60 miles an hour from a standing start in 15 seconds. No steam is visible at any speed owing to the perfected condensing system which is the reason for the increased mileage on water. The experimental car has a 25-gallon tank which, after running over 500 miles, was still more than half full.

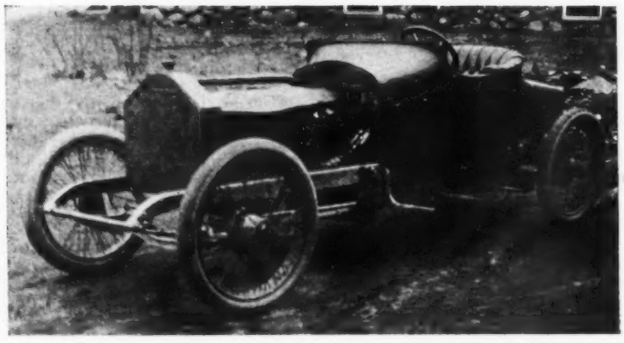


Fig. 1—Doble test car, showing mounting of boiler under hood

Honeycomb Radiator for Condenser

The only difference between the Doble steam car and other previous types is in the successful use of a honeycomb radiator for a condenser. Previous makes of cars which have had condensers have still had trouble in securing an extended mileage on a limited supply of water, due to the fact that the condensation was not complete and that after leaving the condenser steam would pass into the water supply, causing it to boil and causing steam to escape through the overflow pipe. Mr. Doble has used the Stanley type of boiler on his car and many other features of Stanley construction are visible, changes being principally in the valve gear linkage, throttle valve, and, of course, in the water system.

The water system, which is the unusual feature of the Doble car, is shown diagrammatically in Fig. 3. Starting with the water tank, which is of the usual construction except that it is filled through the radiator cap, the water is pumped to the boiler and converted into steam, then going to the engine. So far this is the usual method. Starting with the steam exhausted from the engine, however, as seen in the diagram, Fig. 3, the exhaust is carried directly to the top of the radiator, or condenser. This is a Richardson honeycomb and in the trial car has an area of 43,000 square inches radiating surface. This is said to be about 50 per cent. more than is necessary. From the radiator the condensed water passes back through a venturi mixing passage into the water tank from where it again circulates through the system. The water in the tank, after running continuously with this size radiator, is at a temperature of about 100 degrees Fahrenheit.

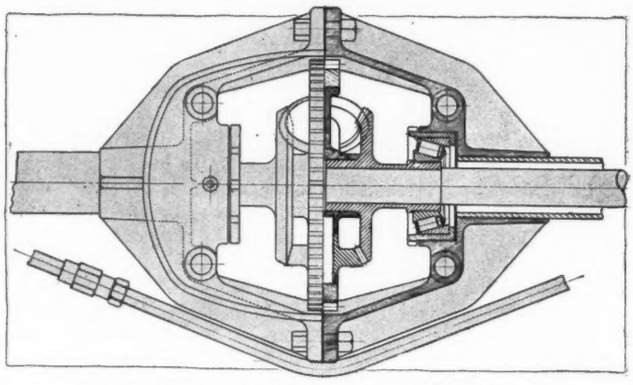


Fig. 2—Differential adapted to the Doble steam car

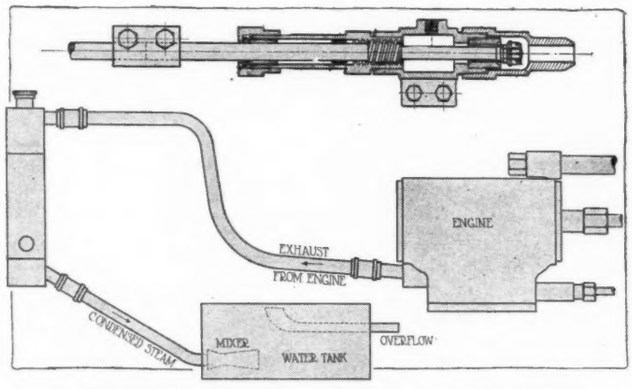


Fig. 3—Doble throttle valve and water circulation scheme

Special Lubricating Compound

One of the points which engineers working with steam cars have heretofore feared is that if a circulating water system were used it would carry the lubricating oil through the boiler and that after a short time the boiler would become carbonized through the burnt cylinder oil and the radiator surfaces would be covered with a greasy deposit which would cut down the radiation. To overcome this difficulty, Mr. Doble uses a special lubricating compound composed of 10 gallons of kerosene as a base, into which is mixed a number 10 can of Oildag and 3 gallons of steam cylinder oil. This, he claims, keeps the boiler absolutely free from any greasy deposit. The combination of this lubricating scheme with the successful use of the honeycomb condenser, Mr. Doble states, overcomes all the difficulties heretofore met in steam car practice.

Detailed improvements have been made in the boiler and engine design. The throttle valve is different from the Stan-

ley type, being a developed screw-down poppet design as shown in Fig. 3. The valve stem is 67 per cent. nickel.

The engine is a 4 by 6-inch horizontal, acting directly on the rear axle. Referring to Fig. 6 a sectional view of the engine is shown. It is operated by locomotive type D slide valve actuated by a Joy valve gear. When unhooked for normal use the valve travel is 1.25 inch and when hooked up for starting the travel is 1 inch. The lap of the valve is 5/16 inch and the lead is constant, as is the case with the Joy gear, at 3/32 inch. Connecting-rods are 15 inches in length and are hollow. They operate on roller bearings, each roller of which is .75 by .75 inch.

The crankshaft is carried on two roller bearings and has the cranks at 90 degrees. The main bearings are 65 by 140 millimeters. The main spur driving gear is mounted on the center of the crankshaft as shown in Fig. 5. This gear has sixty-one teeth on the roadster model and forty-eight teeth on the touring model. It has a face width of 1.25 inches and a 10 diametric pitch. A differential which is shown in Fig. 2, is a three-pinion type operating on hardened pins.

The frame rods of the engine are four in number, terminating at the rear axle yoke. This method of hanging the engine is shown in Fig. 6.

Heating Surface 158 Square Feet

The Stanley type fire-tube boiler has 1,001, 19-gauge steel ferrule-fastened tubes. The boiler is 26 inches in diameter and the tube length 16 inches. This gives a heating surface of 158 square feet. The working boiler pressure for the high speed roadster which is geared 61 to 60 is 750 pounds. For the touring car it is 600 pounds. The steam is superheated in the fire box. The pressure of the steam regulates the height of the flame beneath the boiler and when the water level of the boiler drops below the safe point a thermostat shuts off the burner. The boiler is not fitted with a fusible plug but for safety relies on the automatic shut off and the safety valve which set at 700 pounds on the touring model and at 800 pounds on the roadster.

Pilot Light Independent

While the main burner uses kerosene the pilot flame which is continually lit uses gasoline. A gallon of gasoline will keep the pilot flame lit for about 25 hours. The main burner and the pilot light are two independent systems which results in a great saving for the pilot light since the high pressure for the main burner is not required for the pilot. The pressure under which the fuel is fed is 120 pounds. Starting from a cold condition it takes about 15 minutes to get up steam pressure.

Outside of the mechanism required for driving the car a number of other improvements tending to bring the assembly up-to-date have been made. A Ward-Leonard dynamo is installed for lighting. This installation is unusual in that the drive is taken from the differential drive gear, that is, the large gear which is on the crankshaft of the steam engine. The frame is of channel section and the springs are cantilevers. The steering gear is a Gemmer and the control is by a throttle lever on the steering column. Double expanding brakes operating on one wheel drum are used. These measure 14 by 1.75 on the roadster and 16 by 1.75 on the touring car. The wheelbase is 132 inches. In appearance the car differs but little from the ordinary gasoline automobile, the exhaust gases from the burner being carried through a flue to the rear of the car, the boiler being inclosed under the customary bonnet and the engine having a sheet copper housing which is in a unit with the rear axle housing and acts as the lubricant container.

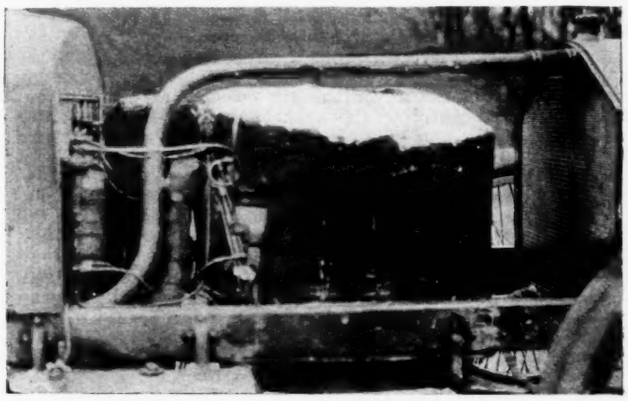


Fig. 4—View of boiler, which is a Stanley fire tube type

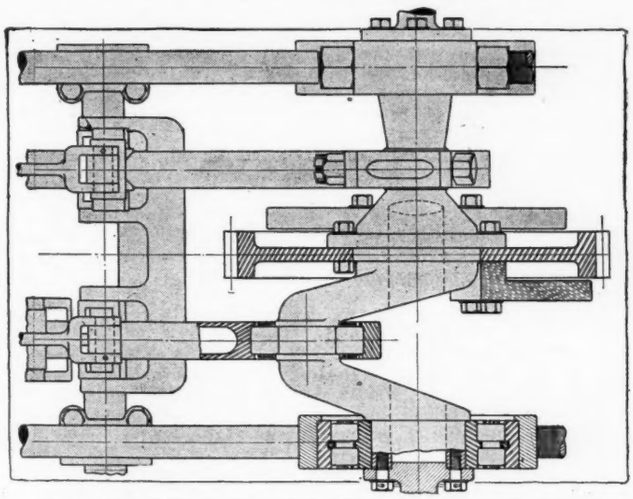


Fig. 5—Plan view of crankshaft showing driving gear mounting

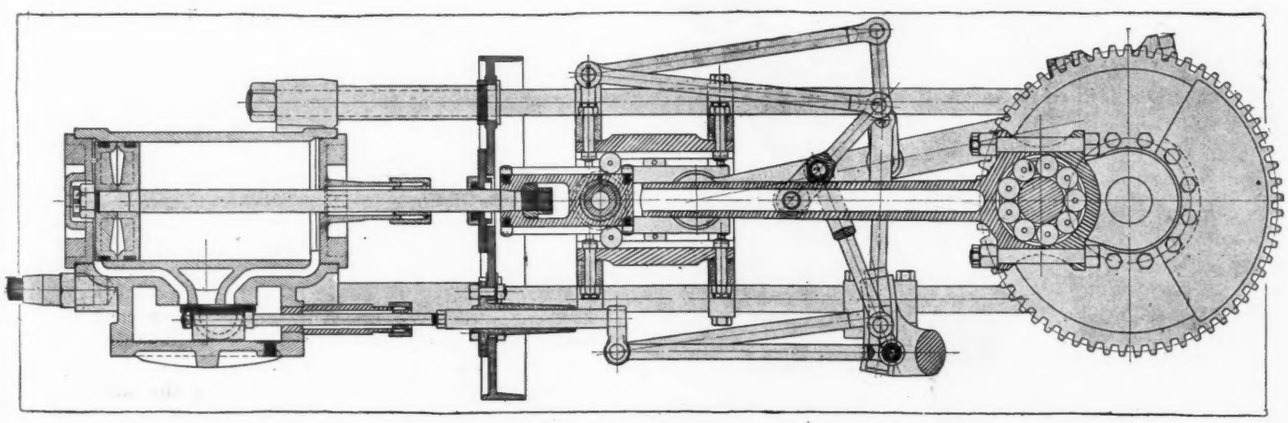


Fig. 6—Sectional view of the Doble steam engine, showing the valves driven by the Joy link motion

Patents of Utility

Improvements in Carbureters Locks, Sparkplug, Bow Rest Rim, Tires, and Spring Suspension

By J. Edward Schipper

A CARBURETER involving the novel feature of a hollow telescopic needle valve has been patented by Frank H. Heitger, of Indianapolis, Ind., No. 1,092,028. Referring to Fig. 1, the carbureter is shown in full assembly as well as in section; the detail of the needle which is really the patented feature is also shown.

In this carbureter, which is a concentric float type, the gasoline enters through the customary needle valve arrangement and surrounds a venturi air passage D, in the float chamber. The gasoline flows through C, passing to the needle valve D; and the air, entering a B, flows upward through the venturi passage shown in the sectional view. The auxiliary air is at E, and the correct mixture is maintained by the functioning of this air valve which is controlled by a spring. The air valve features as well as the general construction of the carbureter are covered in Mr. Heitger's previous patents No. 702,616 and 702,612.

At low engine speeds the gasoline is drawn from the passage C, around the bottom of the stem D into the mixing chamber. The bottom of the stem D, is grooved to form gasoline passages. The air at low speeds enters through B, and through the venturi into the mixing chamber. As the speed increases and the suction becomes stronger the patented features of the hollow needle valve come into action. Gasoline enters through the passage H and would be drawn into the mixing chamber through the passage G were it not for the small conical valve which is seated by its own weight at this point. When the suction increases, however, it soon becomes great enough to lift the small conical valve from its seat and gasoline flowing through the radial openings G enters the mixing chamber and with the increased air coming through the auxiliary valve E, forms the increased charge necessary for the higher engine speeds.

The distance that the conical valve G can lift from its seat is regulated by an adjustment screw A, at the top of the carbureter casting. This and the needle valve, adjustment are the only adjustments necessary on the carbureter. The float level and the spring tension are fixed. Adjustments are held in place by spring detents acting in the corrugations of the adjusting screw heads.

Automobile Steering Wheel Lock

An automobile lock invented by Thomas S. Keffer of Atlantic City, N. J., patent No. 1,090,625, secures the steering wheel of the car so that it cannot be turned and hence renders the car practically inoperative. This lock can be fitted to any car as it does not require a special construction of the steering wheel. As shown in Fig. 2 there is a collar B on the steering sleeve which encircles the entire steering column. This collar is rigidly braced to the dash or floor boards of the car and has no relative motion to the steering column. An extension on the collar B carries a post which in turn, by a hinged joint, supports the arc-shaped locking piece A. When the lock is closed the arc-shaped piece A engages with a locking bolt C rigidly carried on the spokes of the steering wheel.

When the operator of the car wishes to lock it, he pushes the arc-shaped piece under the locking bolt C which engages by means of a spring lock. A specially shaped key is used for disengaging the lock when it is desired to again use the car.

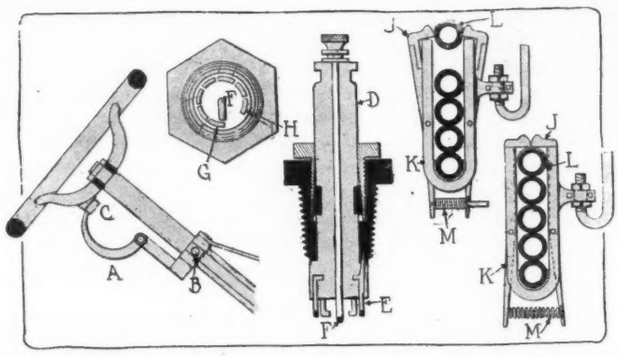


Fig. 2—Steering wheel lock, sparkplug and top bow supporter

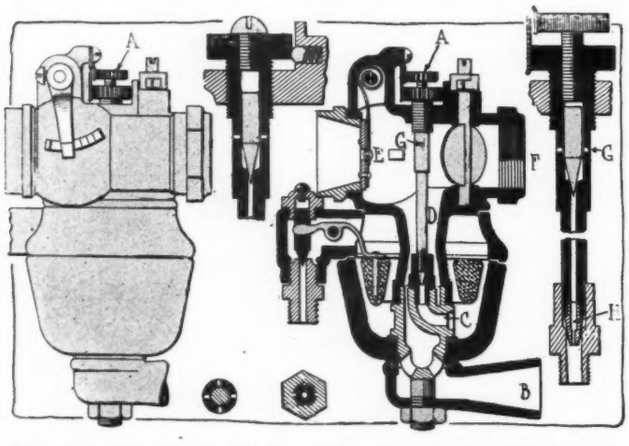


Fig. 1—Details of new Heitger carbureter, showing hollow needle

Support for Automobile Top Bows

A new bow rest patented by Martin J. Molitor and Mathias Britz of Zions, Minn. No. 1,090,329 completely encloses the bows and prevents them from rattling due to the shaking of the car. The rest is shown in sectional view in Fig. 1. The top bows L, are carried in a U-shaped support K, which is provided with a cover J, held closed by an expansive spring M.

The cover which holds the bows within the U-shaped frame is comprised of a pair of arms which are pivoted to the frame and which are seated within the channel of which section the U-frame is composed. The arms carry at their upper extremities the extension J which form the cover when the bows are within the frame. The arms are locked in an open position by so constructing the pin which passes through the center of the expansive spring M that when this spring is compressed a shoulder on the pin engages with one of the arms and holds it in the position shown in the upper view Fig. 1. When this pin is lifted releasing the shoulder catch, the lower extremities of the arms are forced apart by the expansive spring and the lugs J come together thus forming a lock over the top of the U-shaped frame preventing the bows from being jarred out of the frame.

Multi-Spark Ignition Plug

Frank E. Harter of Olympia, Wash. has patented a plug which he claims furnishes a chain of sparks instead of the single spark given in usual plug practice. His invention No. 1,090,815 is illustrated in Fig. 1. The body of the plug is constructed in very much the usual manner, the center D being of porcelain and carrying concentric with its axis one electrode. By means of two nuts and a wedged piece the remainder of the plug is so constructed to form at once the means of fastening the plug in the engine cylinder and also to form electric connection with the grounded current through the engine cylinder. The pin E which is shown at H in the bottom view of the plug is driven into the metal in contact with the engine cylinder as shown in the illustration. This pin, as shown at H is some distance from the central electrode F, but commencing at G and going circumferentially around the plug are a number of metal segments terminating at H.

The inventor claims that when the time for the spark occurs that it will jump from the central electrode F to the point G and from point to point until the circuit is completed at H; thus if the plug were constructed as illustrated, there would be seven sparks, one between F and G and others at each of the spaces between the points shown around the plug.

New Tire with Metal Tread

A new tire with a linked metal tread has been invented by Arthur W. Savage of Duarte, Cal., under patent No. 1,090,-169. According to the inventor the tire is designed for dura-

bility and increased effective tractive effort. In this tire the inner tube is used in the usual manner as shown in Fig. 3. The outer casing and particularly the tread as well as the means for connecting it to the felloe band are the patented features. Referring to the illustration which shows a section through the tire, and one of the sections of the tread, it will be seen that it is made up of a number of metal links. These sections are in turn interlocked, thereby forming an approximately continuous tire formation. There are, however, narrow spaces between the adjacent sections and the interlocking devices, so as to permit play among the several sections. This allows a motion of each section in any direction so as to take care of the natural yielding of the inner tube.

Referring again to the illustration it will be seen that each of the links F, is connected to the adjacent link by a hinged joint and at the ends another hinged joint E connects the tire to the felloe band. This connection is designed to allow the tire a free movement with the exception of a creeping one around the circumference of the wheel. The shape of the tread is so designed that skidding is prevented to a large degree by the tendency of the hardened metal edges to cut into the road surface and thus maintain a firm grip on the road.

Since each band or section may be readily disengaged by disconnecting the series of links at the lock point E replacements can be easily made. Owing to the metal construction of the outside surface of the tire, a minimum risk of puncture is claimed.

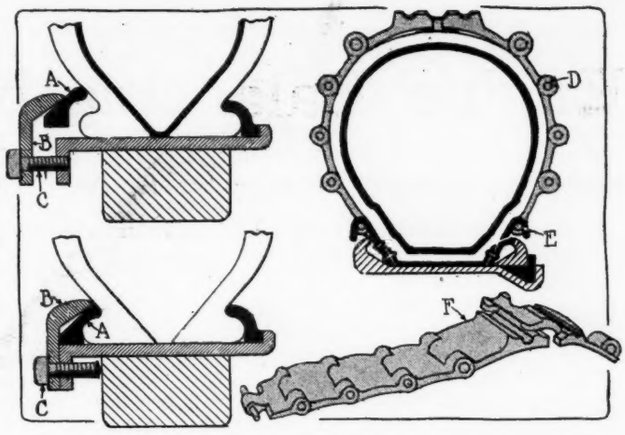


Fig. 3—Sectional view of quick detachable rim and new tire

Sectional Demountable Wheel Rim

A new wheel rim invented by Samuel M. Beery, of Indianapolis, Ind., patent No. 1,090,513 is designed to give easily demountable features with strength and lightness. In Fig. 3, sectional views are shown illustrating the rim in a locked and unlocked position. The body of the rim is built up of an annulus fitting closely about the felloe in the usual manner. This is shown in the sectional views and is the part against which rests the base of the tire. On the outside of this annulus is a right angle flange extending downwardly carrying threaded holes for holding the construction A, B, C by means of the bolts C. The ring B surrounding the rim has a series of lips to carry the demounting bolts C. These lips and the corresponding bolts are spaced equally around the circumference of the rim and form the securing means. For clenching the casing at its outer bead, split resilient ring A is provided to encircle the annulus. This ring has its inner edge undercut to fit against the outer casing bead, and has its outer face bevel as shown in sectional view.

When a tire is in position on the rim as shown in sectional view it is held in position on the inside by a continuous ring and on the outside by a split ring which is provided at intervals corresponding with those in which the lugs or ears extend on the annulus with the similar lugs containing holes through which pass the bolts C. As the holes in the annulus are threaded the entire structure will be drawn up tight when the bolts are taken up. In taking up on the bolt C the bevel edge of the piece B wedges tightly against the bevel on A, thus rigidly confining the casing bead in the undercut faces of the rings and at the same time fastening the split ring rigidly against the annulus, thus holding the entire structure rigidly thereto.

Important claims have been allowed in this patent. There are four of them and claim 1, is given as follows:

1—A sectional tire-rim comprising, in combination, an annulus adapted to encircle and be secured to a wheel felly, means co-acting with one edge of said annulus adapted to co-act with and hold one side of a tire, a split ring having its radially outer face beveled encircling the other edge of said annulus, and means having a lateral movement toward the felly adapted to co-act with the beveled face of said split ring to clamp the tire to the rim.

Shock Absorbing Spring Suspension

Charles F. Fernald of Boston, Mass., has invented a shock absorber which he has patented under No. 1,090,292. The object of the invention is to provide a shock absorber which can be used in conjunction with any of the ordinary automobile springs. Referring to Fig. 4 which shows a longitudinal view of an automobile equipped with the Fernald device, it will be seen that the shock absorbing arrangement is a C-shaped leaf spring attached by a flexible shackle to the frame of the car. This shackle supplants that generally fitted to the car.

In ordinary practice four of these devices are mounted on each side of the car; they are shown in the illustration as A, B, C and D. At E is shown an enlarged view of the installation. The C-shaped spring has two free ends which bear against the upper and lower faces of a lever rod. This lever is supported on a pivot to the frame of the car and supports the spring at one extremity and bears against the shock absorbing device at the other extremity. Every movement of the spring tends to produce a corresponding movement in this lever which is virtually a bell crank lever. Every movement of the main springs induces by this arrangement a counter-acting movement in the C spring, thus tending to absorb its oscillations.

8,259 Motor Vehicles in New South Wales

SYDNEY, AUSTRALIA, Feb. 26.—The state of New South Wales now has 7,619 passenger cars in use, together with 411 commercial vehicles and 229 taxicabs, according to the statistics compiled by the traffic department of the Motor Traders' Assn. The total number of licenses issued to operators of passenger vehicles is 12,098, while there are 411 truck drivers and 351 taxicab operators licensed.

During 1913 there were new registrations recorded to the extent of 2,764 cars and 3,187 drivers.

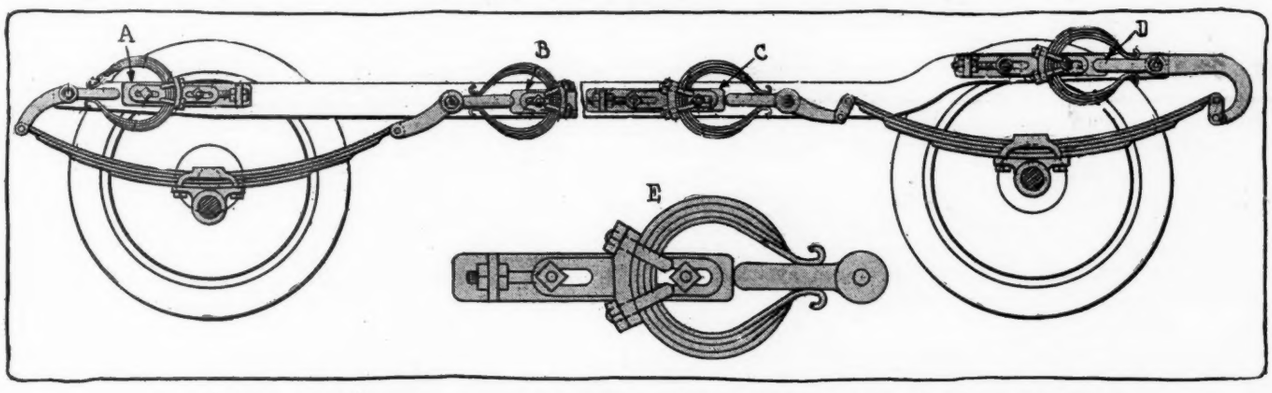


Fig. 4—Shock absorbing spring suspension in which motion is absorbed by use of C-shaped leaf springs

Engine Balancing by Recoil Absorption

Excerpts from a Paper by F. W. Lanchester, Member of Council of the Institution of Automobile Engineers and Consulting Engineer for the Daimler Company

Part 1—Four-Cylinder Balance

IN the ordinary multi-cylinder engine it has been shown that the recoil kick is mitigated by substituting a number of distributed torque applications of small magnitude for the intermittent and heavier torque of the equivalent single-cylinder engine. There is a method, however, by which the torque recoil may be eliminated. It consists in the employment of two flywheels having opposite rotation. Where two flywheels of equal moment of inertia are arranged or geared together to rotate in opposite directions, the storage of energy does not involve a change of angular momentum of the system; thus if, for example, starting from rest, two equal flywheels be given equal velocities of rotation, the one clockwise and the other counter clockwise, as in Fig. 1, a storage of energy has taken place just as effectively as if the two flywheels had been running in the same direction, but the angular momentum of the one is positive and that of the other negative, and the total angular momentum is zero, just as it stood when the flywheels were at rest; hence no torque has been applied to the system from without, and the engine possessing two such flywheels can function without, any rotational recoil kick being transmitted by its holding-down bolts. The same result can be demonstrated by a careful analysis and resolution of the connecting-rod, piston and crankshaft forces, but the author considers the fundamental method of dealing with the problem here adopted to be preferable. It is easy to make a slip in resolving forces and moments in a complicated mass of link work, and it is an altogether wrong way of tackling the problem.

The method of reverse rotation also provides the solution to another problem connected with balancing; thus, an unbalanced reciprocation can be, in effect, balanced by two rotating weights. Referring to Fig. 2, if two spindles, 1 and 1^1, be arranged to rotate in opposite directions and carry respectively balance weights 2 2^1, whose centers of gravity in rotation take up the positions respectively aa^1, bb^1, cc^1, dd^1, ee^1, ff^1, it will be seen that the combined center of gravity of the balance weights follows a straight line path with strictly harmonic motion, the combined centers of gravity being represented by the letters *A*, *B*, *C*, *D*, *E*, *F*, as the spindles revolve.

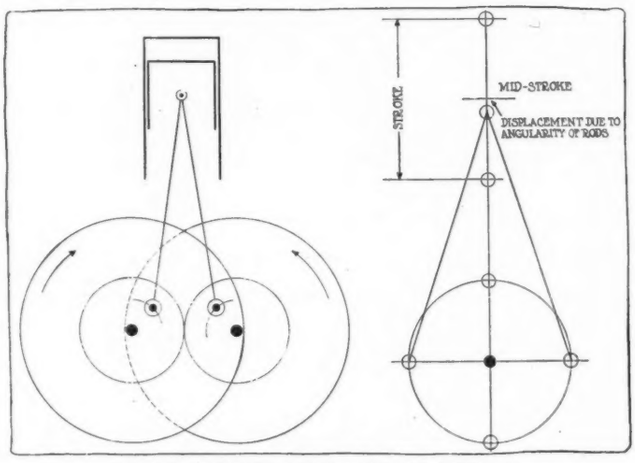


Fig. 1—Left—Oppositely rotating flywheels
Fig. 4—Right—Diagram showing difference in piston displacement due to angularity of the connecting-rods

The Old Lanchester Engine

The principles discussed are conveniently illustrated by the old Lanchester type of engine, which may be said to date from patents Nos. 15045 of 1895 and 13960 of 1896, and which were manufactured over a period of years extending from 1896 to 1903. Referring to Fig. 3, two parallel single-throw crankshafts were provided and fitted with flywheels of equal moments of inertia, geared together by helical gearing. Two opposed cylinders were arranged symmetrically on opposite sides of the plane containing the crank axes, and the connecting-rod system consisted of a symmetrical parallelogram of, functionally speaking, four rods, actually six rods being employed. Both crankshafts were fitted with balance weights whose function was not only to balance the rotating portions of the cranks themselves but also to balance, on the principle already discussed, the reciprocating parts of the engine.

By an inspection of Fig. 3, it will be seen that the distribution of pistons and connecting rods at all times formed a symmetrical figure about a point *A* half way between the centers of the two crankpins, and so the whole motion of the reciprocating parts could be treated as a mass concentrated at the point in question with strictly harmonic motion; it could, therefore, be balanced with mathematical accuracy by oppositely rotating weights on the crankshafts. The engine was not troubled with any rocking moment owing to the fact that the whole of its reciprocating parts had exact symmetry about the transverse vertical plane. The rotational recoil impulse was balanced completely by the reversely rotating flywheels of equal moment of inertia; the fact that these lie in two different planes is of no importance. Though the distribution of the impulses does not take place at equal angular intervals, this is without effect on the balance owing to the absence of rotational recoil.

In connection with this engine, it is of interest to call attention to a kind of vibration that may be felt, or at least may make itself appreciable, apart from any vibration of the engine proper. Let us take an engine of the type under discussion, and, admitting that it is perfectly free from vibration, let us put it to work to drive a car. At each impulse there will be a variation in the flywheel velocity; this, in an ordinary engine, would produce a recoil on the frame, but in the present engine, owing to the reverse rotation, this does not take place. It produces, however, an increased acceleration on the vehicle, that is to say, every time the flywheels are accelerated by the expansion of the gases, the vehicle has to follow suit, and so, owing to the inertia of the vehicle, the transmitted torque, that is to say, the torque

between the engine flywheel and transmission mechanism, is a variable torque, and this in turn reacts on the engine and its mounting.

We have here an extremely interesting property of the engine with reverse rotation (the torque carried by its mounting is precisely the torque impressed by the driven mechanism); in other words, if the work done is intermittent, the torque on the engine mounting is intermittent to a like degree, whereas if the driven torque is constant, the engine mounting is not subject to fluctuation.

It is an interesting point in connection with the motor with reverse rotation that the same means taken to eliminate rotational recoil or kick also eliminates the torque variations and torque vibrations which have been shown to be due to piston inertia.

Distinction Between Causes of Vibration

It is very important to be clear on the distinction between the transmission of vibration to the engine mounting as due to variations in the work done and the transmission of vibration as due to the working cycle of the engine itself. Thus, it may be laid down that in cases where the work done is of an intermittent and vibratory nature, the employment of a motor with reverse rotation may result in transmitting vibrations to the engine mounting to a detrimental degree, and such an engine is therefore bad, whereas in an ordinarily constructed engine with a single flywheel all such vibrations and torque variations are intercepted by the flywheel and are not felt by the engine mounting; it will therefore be seen that, broadly speaking, where questions of vibration have to be dealt with, the conditions have to be studied individually, and what may be right in one case may be equally wrong in another.

It is necessary to devote to the four-cylinder engine more than passing attention. We have seen that the main defective balance is due to the synchronizing of the octave components of the motion of all four pistons, that is to say, the displacements of the pistons as due to connecting-rod angularity all take place in the same sense, so that the forces in a four-cylinder engine tending to set up octave period vibration are four times as great as would be the case in a single-cylinder engine of equal bore and stroke. In Fig. 4 we have represented diagrammatically the movement of the gudgeon pin, corresponding positions of which are given at the "in" and "out" centers and at 90 degrees thereto. If the connecting-rods were of infinite length, all four pistons would reach mid-stroke position at the same instant, and at all other points pistons Nos. 1 and 4 would by their motion accurately compensate for Nos. 2 and 3. In an engine with a rod length of about two and a quarter times the stroke (Fig. 4), there is a considerable departure from this in the position of the pistons when they should be at mid-stroke. Thus, when the crankpin is at 90 degrees from the in-center, all four pistons are somewhat below their mid-stroke position; in the case of an ordinary 20 or 25 horsepower engine (R. A. C. rating) the error of position amounts to about a quarter of an inch. Let us express the length of the connecting-rod in terms of the crank throw = unity, and take the ratio as 4.5; then, in Fig. 4, if A be the position error of the gudgeon pin at mid-stroke, as due to connecting-rod angularity, we know that A is approximately equal to the crank throw divided by twice the connecting-rod length, or in the present case one divided by nine. But the quantity A is the total amplitude of the octave vibration of the piston, hence the octave amplitude is 1-18th of the stroke. Now, since the force is proportional to the square of the periodic speed, the maximum disturbing force due to the octave components of the piston motion will be 4-18ths of that due to the main component of each piston; multiplying this again by four to represent the whole engine, we have the unbalanced force due to the octave component in a four-cylinder engine nearly as great (in the relation of 16 to 18) as the main unbalanced piston force of a single-cylinder engine of equal bore and stroke. This comparison is given graphically in Fig. 5, which represents the unbalanced forces in a four-cylinder engine in comparison with the unbalanced forces in a single-cylinder engine of equal bore and stroke, assuming the base chambers of both engines to be bolted rigidly to the foundations.

Defects of Balance in Four-Cylinder Type

As an illustration, we may take the case of an engine of about 20 R. A. C. rating, stroke = 130 millimeters, running at 2,000 revolutions per minute with a total reciprocating mass of 12 pounds; the maximum value of the unbalanced alternating vibratory forces under the conditions stated is approximately 800 pounds.

In addition to its defect in the matter of the secondary vibration as above, the four-cylinder engine is affected by another of the forms of want of balance to which the single-

(*Continued on page* 791)

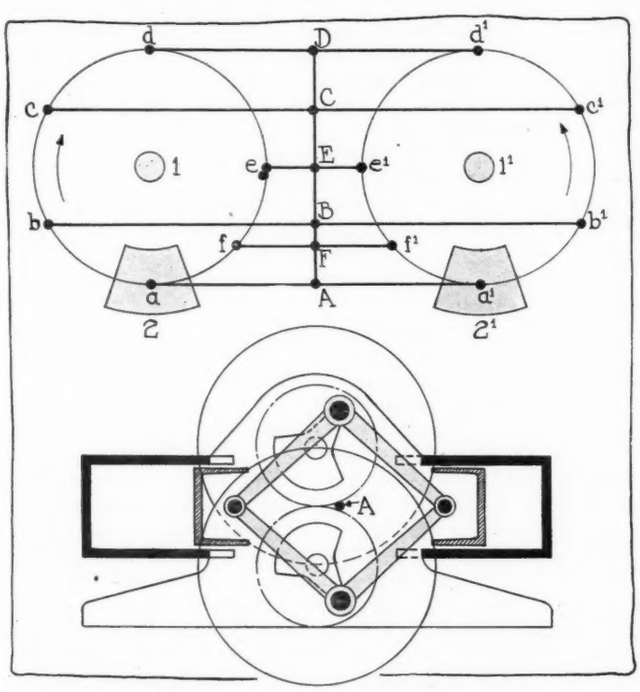


Fig. 2—Upper—Diagram of moments of reversely rotating weights.
Fig. 3—Lower—Symmetrical disposition of cranks and connecting-rods

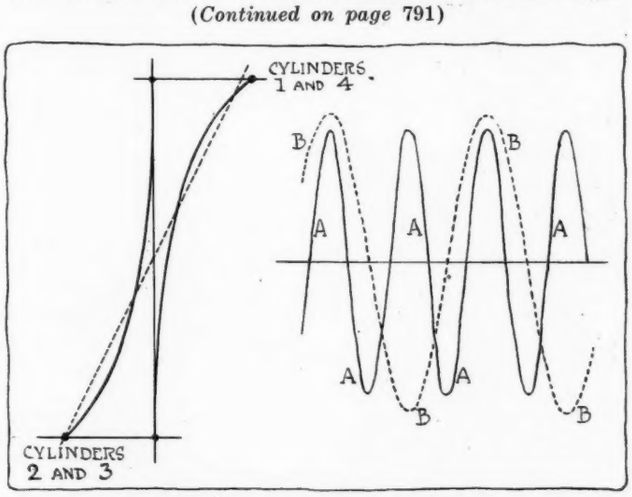


Fig. 5—Right—Unbalanced forces in a four-cylinder motor compared with those in a single-cylinder
Fig. 6—Left—Combined indicator diagrams, motor running against compression

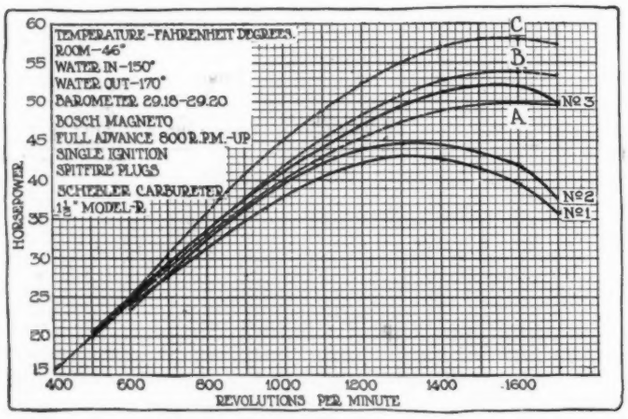
Testing double exhaust line on Howard Six motor

Double Exhaust Shows Efficiency

Test Shows That Power Output Is Increased by It on Both Four and Six

CONNERSVILLE, IND., April 2—Announcement is just made of the results of a series of tests on a special design of double exhaust line conducted by J. C. Moore, chief engineer of the Lexington-Howard Co., at the Wheeler & Schebler laboratories at Indianapolis. The results of these tests, according to Mr. Moore, show a distinct gain in power at higher engine speeds for the double exhaust.

Beginning March 21, the tests were run over a period of 2 weeks in order to obtain figures on average results. The Moore multiple exhaust system was fitted to both a four and a six-cylinder motor and a gain in maximum power was noted for each. It was found that with a standard manifold, tube and muffler the six-cylinder, 4.125 by 5.25-inch Continental motor used in the Howard car developed its maximum power at 1,400 revolutions per minute when it showed 42.5 horsepower. This was with a 2-inch exhaust pipe and one muffler, 7 inches diameter by 24 inches long.



Curve No. 1—Using Kinsey muffler, 7 by 24 inches with 1 7-8-inch exhaust tube (single system). Curve No. 2—Using Oldberg muffler, 7 1-2 by 20 with 2 1-4-inch exhaust (single system). Curve No. 3—Using multiple exhaust system, 5 by 24-inch twin mufflers and 1 5-8-inch exhaust tubes. Dotted Curve A—Using Standard manifold, 2 1-4-inch tube with no muffler. Dotted Curve B—Using Multiple manifold 1 5-8-inch tubes with no muffler. Dotted Curve C—Using multiple manifold and no muffler. Carbureter readjusted to suit

When the size of the exhaust pipe was increased to 2.25 inches and with a 7.5 by 20-inch muffler, the power developed by the engine was increased to 44.3 horsepower, a gain of 1.8, at the same speed, 1,400 revolutions per minute.

Upon fitting the Moore multiple system it was found that the horsepower at 1,400 revolutions per minute was an even 50, an increase of 7.5, and, furthermore, that the maximum horsepower was not attained until the engine attained a rotative speed of 1,600 revolutions per minute when the horsepower had reached 52.2. Twin tubes and mufflers were used, the tubes being 1.625 inch and the mufflers each 5 by 21 inches.

A difference in the operation of the carbureter was also noted with the two different exhaust systems. Before fitting the double exhaust the 1.25-inch carbureter required a No. 6 needle, No. 21 air spring and .5-inch venturi to obtain the best results. With the Moore system a finer needle, No. 8, a lighter air spring, No. 17, and a wider venturi, .625-inch were required. This would indicate on the face of it, a greater economy for the multiple exhaust.

In order to determine if the same results were obtained in the four as on the six, a Lexington four motor was tried and parallel results were again obtained. It was discovered that, while the motor reached its maximum power of 31.3 horsepower at 1,600 revolutions per minute, with the single exhaust system, with the multiple system the motor developed 34.3 horsepower at 1,500 revolutions per minute, a gain of 3.2 horsepower at 100 revolutions per minute slower speed.

The graphic story of all the tests is shown in Fig. 2 where a series of curves is given. The tests were held under the direction of Aaron Handy, experimental laboratory engineer of the Wheeler & Schebler Co.

De Dion Brings Out Car with Four-Cylinder Block Motor

FOR 1914 there will be a new De Dion which will be a somewhat different product than has ever been put out by this company before. It is a 10-horsepower, four-cylinder motor in a chassis of 103.25 inch wheelbase and fitted with either a touring or runabout type of body. The car is illustrated herewith and is fitted with a body that embraces the latest in the design of its lines and equipment.

This motor is the first four-cylinder unit power plant manufactured by the De Dion company. It has a bore of 56 millimeters and stroke of 120 millimeters. This gives in inches a 2 3-16 by 4 3-4-inch power plant. The cylinders are L-head and the engine fitted with Bosch single ignition, and a Zenith carbureter. Power is delivered through a two-bearing crankshaft.

The motor is distinctly a high-speed type, being geared 5.25 to 1 on direct and developing its maximum horsepower, 14, at 2,000 revolutions per minute. The power of the motor at 1,500 revolutions per minute is 11 horsepower. The car is capable of a speed of 40 miles per hour.

A three-disk clutch is used and a three-speed and reverse sliding selective gearset. These units are all in one housing and, as is usual with De Dion practice, are suspended at three points. The rear axle is a floating type and the weight of the car is carried through a pressed steel housing. The tread of the car is but 48 inches, which is 8 inches less than standard. The wheels carry 29 by 3.5-inch tires.

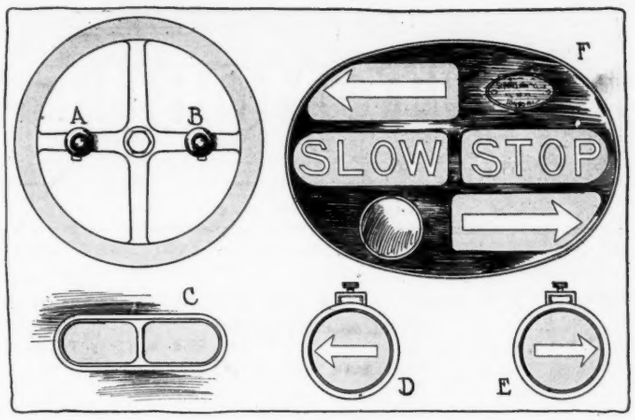
Right drive and right control are used in this car. The gasoline tank is in the dash and the body is equipped completely. Five lamps, five tires and five Rudge-Whitworth wire wheels are supplied with the car which sells for $2,200 in the touring model and $2,000 as a runabout. The De Dion

company will make 3,000 of these during the coming year, which is a considerable proportion of the entire De Dion output, which is estimated at 5,500 cars for the year. This model therefore becomes an example of quantity production, for a European plant. It is a highly-finished little vehicle especially designed for light touring and suburban work It includes such conveniences as a toilet case back of the front seat and eight leather pockets disposed about the body.

Simms Traffic Warner Made in Two Types

LONDON, ENG., March 18—The Simms traffic regulator which has recently been put on the market is made in two styles, one of which merely indicates the direction in which the car is about to turn, while the other also advises the driver of a car behind that the car in front is about to slow up or stop. In the former case, two electric lamps are fitted to the back of the car. These have ground glass faces and white arrow with a red background. The two switches shown at A and B in the illustration are operated by the driver's thumb. Each of these operates one lamp, the direction of the arrow showing which way the car is about to turn. It can be so arranged that the right and left lamps are automatically switched on by the turning of the steering wheel.

The more elaborate installation not only gives warning that the car is about to turn but it can also notify that it is about to slow off or stop. The slow signal appears whenever the clutch or foot brake is applied, the stop signal coming into action when the emergency is put on.



Simms traffic warner. Left turn switch at A, right turn at B. With lamps combined at C and separate at D and E. F shows the complete device

The four indicators all contained within the same casing which also carries the tail lamp for illuminating the number plate.—From *The Car.*

Engine Balancing by Recoil Absorption

(*Continued from page* 789)

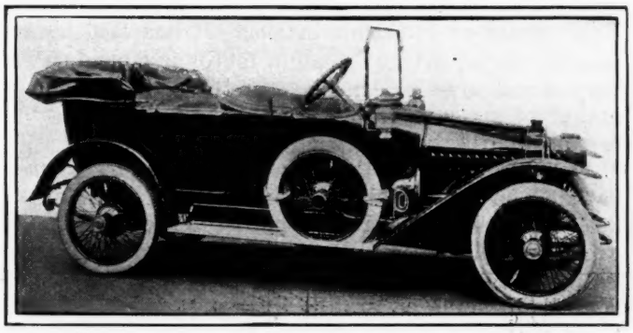
cylinder engine is liable, that is to say, the torque alternations due to piston inertia. In the four-cylinder engine the whole of the pistons are at rest at the same instant of time, and the whole have their maximum velocity at approximately the same point. Thus, as in the one-cylinder engine, there is a continual give and take of energy between the flywheel and the pistons, which results in an intermittent torque about the crankshaft axis. The magnitude of this torque in the four-cylinder engine is that of the sum of its combined elements, that is to say, it is four times as great as in the case of a single-cylinder engine of equal stroke and piston weight. The four-cylinder engine also (as in the single-cylinder) has a torque alternation due to the work done in compression and restored in expansion. This torque variation may be treated as part of the functional torque variation due to the total cycle of operations, and from this point of view the torque variations due to the compression and explosion pressures cannot be separated.

We have already seen that torques due to pressure and those due to piston inertia are actually superposed, and since in the four-cylinder engine there is a compression in one cylinder or another on every stroke of the engine, they are of the same frequency, and there are conditions of running under which these variations in some degree cancel out.

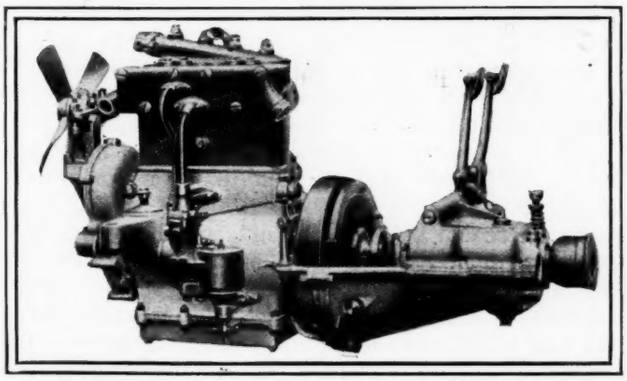
Let us suppose that powerful springs are fitted, tending to bring the pistons to their mid-stroke position; then it is evident that there is some particular running speed of the engine which corresponds to the period of the springs and piston masses, and at this critical speed no torque variation will be required. The particular speed in question is that at which the kinetic energy of the piston in its mid-stroke position is just equal to the energy stored in its spring when fully compressed, so that at every point in the stroke the total of the energy in the springs and the kinetic energy in the pistons will be constant. At this speed, since the energy of the system does not fluctuate, there will be no give and take of energy between the pistons and the flywheel, and so the torque fluctuations, otherwise necessary, will not occur.

Now, in fact, there is no such spring system as that indicated, but if we consider the combined effect of the four indicator diagrams, assuming the engine to run against compression only, it will be seen by referring to Fig. 6 that the combined indicator diagrams would be such as to simulate with a fair degree of approximation a straight line spring diagram, and so in an actual engine the form of vibration now under consideration will be far less apparent when running on compression than when closely throttled down.

(To be continued)



New 10 horsepower four-cylinder car brought by De Dion-Bouton



Four-cylinder, 10 horsepower block motor used in new De Dion

The Automobile

PUBLISHED WEEKLY

Vol. XXX Thursday, April 9, 1914 No. 15

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

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Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Eating the Pudding

A FOUR-CYLINDER motor with bore 3.5 inches and stroke 4.75 inches has a piston displacement of 183 cubic inches. It has 19.6 horsepower, official rating. Such a motor is considered a very small one in America, in these days when a maker of six-cylinder designs feels he is getting below normal if the bore is cut to 3.5 inches.

France does not think such motors too small, rather, she thinks this limit large. Let our readers be their own judges as to whether these dimensions are too small or not. Recently France staged a reliability tour of 3,000 miles around the country, the route embracing several of the worst mountain sections of the country, sections that are little known to the tourist, in that he has deemed the roads too rough, or the mountain passes too high.

This 3,000-mile tour was limited to little cars of 183 cubic inches piston displacement. That was the biggest class, and there were other divisions, the smallest being but 6 cubic inches displacement.

All of these vehicles had to average 19 miles per hour over these routes, and had to cover from 180 to 280 miles per day with runabout bodies. Their parts were all sealed before the start, and breaking of a seal for any reason disqualified the car. Arriving late at a control also disqualified. At the end of the tour there was a 67-mile road race in which each car had to compete without a single adjustment for speed or repairs. During the run were other numerous hill-climbs, etc.

It cannot be denied that such was a strenuous test. It was the most strenuous test ever staged by France. It was a more strenuous test than ever staged in America in the days of stock cars, and stiff technical examinations at the end of the run.

If small cars would endure such a test and show speed at the finish they must be sufficiently satisfactory for a citizen of any land, America included.

Look at the results of this tour told on other pages of this issue. Of the thirty-three to start, thirteen finished and took the 67-mile road race. The winning car after its sealed parts had made a 3,000-mile tour was able to average over 58 miles per hour for 67 miles.

Is not this enough?

What more can the rational buyer desire?

What more should the rational manufacturer aim after?

True, this speed was the speed of the winner, but others were able to demonstrate good speeds after such an ordeal. One American Buick averaged 48.6 miles per hour and its running mate over 40 miles per hour in the final test. The figures of the speed abilities of the others are also told.

Many American makers are holding aloof from the small high-speed motor because they think that the American public will not accept it. They think that the horsepower will be too low to be a good seller. They think that the vehicles will be too light to stand up. The proof of the pudding is always in the eating thereof. Let our makers build cars to these smaller limitations of motor and weight. This done, stage one of the most difficult and strenuous tests. Make it a great national argument for smaller motors, for lighter cars and for rational hill-climbing ability and rational speed.

Such a contest, participated in by our big and little makers, would do more to mould public opinion in America than any other argument that could be advanced.

The Automobile Museum

GRANTED that authentic history is generally written years after the occurrence of the facts, this in itself should not preclude the possibility of the great motor movement in America erecting some national monument to its inception and development during the years when its muscles are in the formative stages, so that the matured industry will have a faithful record of its early achievements.

Why should not our industry erect some form of national museum in which would be gathered together all of the pioneer efforts in automobile construction, as evidenced in existing vehicles as well as parts? By the end of this century the citizens of this land will be hungering and thirsting after authentic facts regarding the early cars, the cradle days of the industry. Unless something is done today, many of the real early efforts will have been long lost at that date.

Today, with some effort, it would be possible to get together the pioneer models of many of our leading companies, but these represent only a fraction,

and a small one, of the early inventive and constructive effort. It is to-day too late to get together intact a score or more of the early machines, but better start now than 10, 20, 40, 50 or 100 years hence.

A national automobile museum could be started in no more fitting place than Detroit, the greatest automobile city of the world. Here many of the greatest problems in the evolution of our industry have been worked out. Here is a city destined for years to hold the premier place in motor manufacture, and here is a city fittingly situated to be the proud possessor of a national museum of automobiling. Detroit is in the heart of the great natural means of inland water transportation on the North American continent.

Our National Automobile Chamber of Commerce should take up this movement of preserving our earliest vehicles; our Society of Automobile Engineers can lend valiant assistance, and there are today living in our land hundreds who have been eyewitnesses, or end men, in the development of the various units of the automobile, that are today forming its warp and woof. Get the information in written record before it is too late.

February Car Exports, $2,378,494

A Gain of 449 Cars Credited to Pleasure Vehicle with Slight Loss in Value, While Foreign Truck Shipments Are Off More Than a Third—Eight Months' Car Increase Exceeds $1,000,000

WASHINGTON, D. C., April 6—There was a falling off in the exports of commercial cars during February last, as compared with the corresponding month of last year, while the exports of pleasure cars showed an increase, according to returns issued today by the bureau of statistics. This was also the case with the exports for the 8 months' period ending February.

Reeves En Route to Factories.

NEW YORK CITY, April 7—Alfred Reeves, general manager of the National Automobile Chamber of Commerce, left yesterday for a 2 weeks' trip to Cleveland, Toledo, Indianapolis and Detroit. Mr. Reeves will visit the leading automobile factories.

To Determine Rights of Patent Owners

CLEVELAND, O., April 8—There is at present pending for hearing in the United States District court here an interesting case which is looked upon to answer the question as to whether or not the owner of a patent can use it as alleged injury to the business of another manufacturer before the time when the scope of the patent has been determined by the Court. The case in question involves a suit brought by the Positive Supply Co., Davenport, Ia., against the Adamson Mfg. Co., E. Palestine, O., which holds patent No. 1,057,911 on a form of vulcanizer for tire repairs. The suit entered by the Positive Supply Co. is for damages for alleged libel arising from injuries the Iowa concern claims to have suffered in reputation and business in portable vulcanizers because the Adamson Co. has, it is claimed, threatened, but failed, to bring suit for infringement of its patent.

Automobile Tires Now Mailable

NEW YORK CITY, April 6—Further heavy inroads in the business of the express companies will now be made by the parcel post as the result of a new ruling made by the post office department. It will now be possible to ship not only automobile tires through the mails but also automobile wheels, carriage rims and other materials.

When the parcel post law first went into effect the ruling excluded packages exceeding 72 inches in circumference.

EXPORTS OF PLEASURE CARS AND TRUCKS.

	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1913		1914		1913		1914	
	Number	Value	Number	Value	Number	Value	Number	Value
Commercial	83	$134,992	57	$83,461	545	$1,007,367	493	$797,722
Passenger	2,388	2,495,105	2,837	2,378,494	13,943	13,845,261	16,390	14,919,087
Total	2,471	$2,630,097	2,894	2,461,955	14,488	14,852,628	16,883	15,716,809
Parts (not including engines and tires)	....	444,728	....	$612,813	.....	2,983,336	.....	$4,222,301
Total automobiles, and parts	....	$3,074,825	....	$3,074,768	.....	$17,835,964	.....	$19,939,110

EXPORTS BY COUNTRIES.

	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1913		1914		1913		1914	
COUNTRIES	Number	Value	Number	Value	Number	Value	Number	Value
France	41	$40,222	72	$49,011	418	$329,410	536	$410,814
Germany	50	42,605	108	79,600	297	273,640	590	413,144
Italy	24	19,392	16	12,434	192	169,645	211	156,144
United Kingdom	431	359,779	1,269	1,017,594	2,114	1,627,889	4,781	3,822,919
Other Europe	100	91,968	262	193,736	826	714,510	1,151	906,827
Canada	916	1,086,560	292	361,895	4,070	4,972,954	2,187	3,021,377
Mexico	38	86,854	9	10,071	231	426,159	133	217,528
West Indies and Bermuda	42	44,367	38	35,854	297	308,224	372	348,599
South America	283	304,630	115	88,244	1,944	2,147,130	1,463	1,500,584
British Oceania	168	170,771	374	320,195	2,037	1,885,099	2,516	2,166,771
Asia and other Oceania	199	220,805	199	180,509	1,332	1,289,242	1,468	1,432,323
Other countries	179	162,144	140	112,812	730	708,726	1,475	1,325,779
Total	2,471	$2,630,097	2,894	$2,461,955	14,488	$14,852,628	16,883	$15,716,809

IMPORTS BY COUNTRIES.

	FEBRUARY				EIGHT MONTHS ENDING FEBRUARY			
	1913		1914		1913		1914	
COUNTRIES	Number	Value	Number	Value	Number	Value	Number	Value
France	13	$29,603	4	$8,829	290	$689,027	103	$257,592
Germany	9	22,782	....	.....	63	161,291	15	37,307
Italy	5	9,835	....	.....	84	138,615	39	58,666
United Kingdom	4	15,192	2	4,546	66	187,993	36	110,222
Other countries	2	4,707	3	7,200	66	152,419	37	65,572
Total	33	$82,119	9	$20,575	569	$1,329,345	230	$529,359

Owner Not Liable for Driver

U. S. Supreme Court Holds Michigan Law Is Unconstitutional—Ends Famous Parrott Case

WASHINGTON, D. C., April 7—Chief Justice White today handed down a decision in which he held the Michigan law which holds the owner of a car responsible for accidents caused by his chauffeur, when the car is taken out without permission, unconstitutional. The decision is in the case of John W. Parrott, a farmer, who had obtained a judgment in the Michigan Court against the Metzger Co., Detroit, because a tester in the employ of the company had taken a car without the consent of the company for a joy ride and struck Parrott on the road. Parrott sued and was given a judgment in the lower court, but Chief Justice White reversed this judgment with costs and the case was remanded for further proceedings.

One paragraph of the present Michigan motor vehicle law reads: "The owner of a motor vehicle shall be liable for any injury occasioned by the negligent operation of any person of such motor vehicle, whether such negligence consists in violations of the provision of the statute of this state, or in the failure to observe such ordinary care in such operation as the rules of the common law require; but such owner shall not be so liable in case such motor vehicle shall have been stolen."

The existing law has been the subject of considerable comment in Michigan, because of the danger of making the owner liable for damages, resulting from the operation of their machines whether the chauffeur operating same be acting directly for the owner or not, and the present decision of the Supreme Court will be welcomed as clarifying the atmosphere.

Anderson Patent Involves Air Control Features

NEW YORK CITY, April 7—Patent No. 1,041,708 granted to William K. Andersen October 15, 1912, which has come into prominence owing to the fact that it is the basis of a suit just filed by the Flechter company against the Stromberg Motor Devices Co., involves a double spring control of the auxiliary air valve.

Referring to the illustration the air valve which Flechter claims is copied in the Stromberg carbureter is shown. At slow speed air is admitted to the carbureter through the customary venturi arrangement, but at higher speeds the air valve comes into action. The valve A, is seated against the casing B, and is held thereto by the spring D. As the suction of the motor increases the valve A is lifted from its seat against the compression of the spring D. After it has left its seat and has travelled a short distance it comes in contact with the spring E and before it can lift further from its seat it must resist the combined efforts of springs D and E.

Two independent adjustments control the action of these two springs. The tension on the spring D is increased or decreased by turning the entire casing B, which is held in a screw thread within the casting C, to the left or right. The other adjustment consists in regulating the travel of the valve A before it bears against the secondary spring E. This is done by turning the nut G which carries with it the threaded valve stem. The knurled nut G is held tightly against the casing at L by the spring H. The adjustment of the tension of the primary spring D is held by the ball and spring detent F.

Charges Tire Pressure Gauge Infringement

NEW YORK CITY, April 4—A. Schrader's Son, Inc., has brought suit against the 35 Per Cent. Automobile Supply Co., in the District Court of the United States for the Southern District of New York alleging infringement of the Twitchell patent on the pencil type of pressure gauge for pneumatic tires. The plaintiff states that other suits will follow.

The plaintiff prays for an answer, a perpetual injunction that the defendant be made to account to the plaintiff for all infringing gauges made and sold and that the damages in the case be tripled. The plaintiff also prays that the defendant pay the costs of the suit.

The patent on which the suit is based is No. 927,298 and was applied for October 9, 1908, by Charles R. Twitchell and granted July 6, 1909. The validity of this patent was upheld in two suits, one brought by Twitchell against the Northam Pressure Gauge Co., in the U. S. District Court for the Southern District of California, Southern Division, and the other against Rudolph & West in the Supreme Court of the District of Columbia. In New York City decrees *pro confesso* were entered in the United States Circuit Court for the Southern District of New York against the Prest-O-Lite Co. and the New York Sporting Goods Co. Twitchell brought suit October 26, 1911, in the same court against A. Schrader's Son, Inc., and this firm brought the litigation to a close by purchasing the patent.

Grossman Gets Battery Connector License

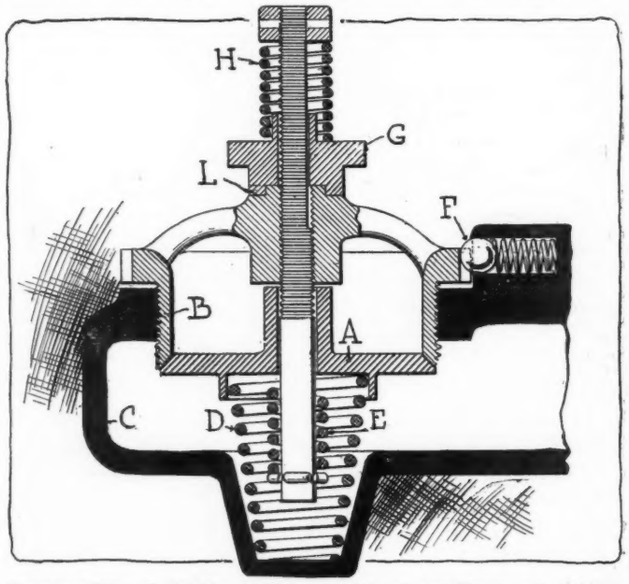
NEW YORK CITY, April 1—The Emil Grossman Mfg. Co. of this city has been licensed under the Hammond patent to manufacture the Holdfast battery connector. This connector is made up of two metal flanges with a hole in each to fit over the plug electrode. When the flanges are pressed together against the resistance of their spring the holes coincide and so slip over the plug electrode. Once the flanges are released they tend to separate and immediately bind on the electrode. The patent is owned by Wm. B. Hammond, New York City and is No. 1,086,820.

George E. Shaw, formerly factory representative of this company, has been made western manager with offices in Ford building, Detroit.

Rauch & Lang Sued on Windshield Patent

CLEVELAND, O., April 2—A patent infringement suit has been brought against the Rauch & Lang Carriage Co., this city, by J. R. Wardrop, W. P. McFarlane and W. B. Hanlon, the latter the inventor of a windshield, patent No. 993,061 issued to him on May 23, 1911.

The feature of this patent is that it uses two panes of glass forming the upper half of the windshield. One pane is in front of the other. The outer one can be swung outward and forward forming a protector against snow and rain and affording a clear vision, while the inner glass re-



Construction of double spring control of auxiliary air valve—involved in Flechter-Stromberg suit

mains vertical forming a complete windshield in conjunction with the single pane which constitutes the lower half of the windshield. To give a variety of protection as well as affording ventilation for closed bodies, both the panes in the upper half are movable.

Bowman Co. Amends Answer in Starter Suit

NEW YORK CITY, April 7—In the suit of the Dayton Engineering Laboratories Co., Dayton, O., against the Sidney B. Bowman Automobile Co. of this city for alleged infringement of patents Nos. 745,157 and 842,827, on electric starter construction, the latter company has amended the answer which it made last October. The Bowman company also made a motion for a bill of particulars to make the plaintiff name a specific date of invention but the Court denied this motion on the ground that such date might be used in some future case.

The solicitors for the plaintiff consented to the amendment to the defendant's answer as follows:

In paragraphs VIII, IX, X, by including "12" among the claims of Coleman patent No. 745,157 specified as those in the suit.

Also in paragraph X by including among the British patents set up by way of anticipation British patent No. 26,302 of 1896 to Francis William Greengrass on improvements in, and relating to, self-propelled road vehicles, and British patent No. 11,058 of 1896 to Ernest John Clubbe et al, on improvements in motor cars.

Also by inserting as paragraph X, 2, the following paragraphs:

X, 2 and this defendant further answering, avers that the claims in suit (Nos. 3, 7, 9, 12, 17, 18, 20 and 24) of said Letters Patent No. 745,157 are each and all of them void in that the said alleged improvements and inventions thereby claimed had been prior to the alleged invention thereof by said Coleman, or more than 2 years prior to the date of his application therefor, made or invented and were known to and publicly used by the following named persons and at the following named places, to wit:

David N. Melvin, of Linoleumville, N. Y., at Linoleumville, N. Y., and elsewhere, and

John H. Munson, of Laporte, Ind., at Laporte, Ind., and elsewhere.

Also by inserting as paragraph XIII, 2, the following paragraph:

And this defendant further answering avers that the claims in suit (Nos. 2, 3, 7, 9, 19 and 26 of said Letters Patent No. 842,827 are each and all of them void in that the said alleged improvements and inventions thereby claimed had been prior to the alleged invention thereof by said Coleman, or more than 2 years prior to the date of his application therefor, made or invented and were known to and publicly used by the following named persons and at the following named places:

David N. Melvin, of Linoleumville, N. Y., at Linoleumville, N. Y., and elsewhere, and

John H. Munson, of Laporte, Ind., at Laporte, Ind., and elsewhere.

The complaint is based on the following: On March 24, 1913, the defendant sold a four-cylinder Marmon car equipped with an electric starting device made by the North East Electric Co., of Rochester, N. Y., which device the Dayton Engineering Laboratories Co. claims is an infringement of the Delco patents. The suit was brought against the New York City firm rather than against the Rochester company in order that the case might be argued before judges of the Southern District of New York rather than at Rochester or at Buffalo.

Walpole Tire Co. Sale May 11

BOSTON, MASS., April 1—The sale of the Walpole Tire & Rubber Co. will be held on May 11, taking place at 10.30 a. m. at the factory. The sale will be at public auction. The upset price, according to the order of sale issued by Judge Dodge, must be $1,150,000.

A tentative plan of reorganization of the company, prepared by the stockholders' committee and protective committee, is going out to stockholders. These committees do not approve of the plan recommended by Attorney Metzler, explained in THE AUTOMOBILE of March 19.

Plan for Reorganization

The new plan contemplates the capitalization of $1,250,000, 7 per cent. cumulative preferred, and $2,500,000 common, old preferred stock. The preferred stockholders assenting will be given the right to subscribe for 50 per cent. of the present holdings in new preferred and will receive par value of the present holdings of preferred in new common which carries voting power. The non-assenting preferred stockholders will receive 50 per cent. in new common. The common stockholders will have the right to subscribe for one share new preferred accompanied by a bonus of one share of new common for every fifteen shares of the common stock, now held.

R. & L. Co. Loses in Royce Patent Suit

Means of Suspending Motor and Gearbox Is Infringed— R. & L. Must Pay Costs

NEW YORK CITY, April 7—Final decree has been entered in the case of Frederick H. Royce, of the Rolls-Royce Company, English automobile makers, vs. the R. & L. Co., in the U. S. District Court for the Southern District of New York. The Court held that F. H. Royce is the sole owner of patent No. 888,535, granted May 26, 1908, and that the R. & L. Co. has infringed this patent by selling Garford cars embodying infringing features. The R. & L. Co. is enjoined from making, using or selling automobiles embodying infringements of the patent during the life of the patent and the R. & L. Co. is to pay the costs.

The claim of the patent which was held to have been infringed is as follows:

"Means for suspending the motor and gearbox in the frame of an automobile, comprising four arms projecting from each part, the rear two of which are rigidly fixed to the frame, bell-crank levers, pivoted to the two other arms, the one end of each bell-crank lever being connected to the frame, and a coupling rod connecting the other ends of the said bell-crank levers, as set forth. The combination with a frame, of a motor, the casing of which is rigidly attached to the said frame at the rear end, two bell-crank levers pivoted to the front end of the casing of the motor, one at each side thereof, the one arm of each bell-crank lever being pivoted to one of the side members of the frame and a rod coupling the other arms of the two bell-crank levers, and the same with the gearbox mounting."

CHICAGO, April 4.—Beginning April 1, E. J. Moon, son of J. W. Moon, president of the Moon Motor Car Co., is the general manager of the Moon Motor Car Co. of Illinois, the offices and salesroom of which are located at 2612 South Michigan avenue, Chicago.

Two New Winton Branches Announced

CLEVELAND, O., April 4—The Winton Motor Car Co. announces the opening of two new branches, one in Los Angeles and the other in Cincinnati and the early removal of its Chicago branch to larger quarters.

In Los Angeles the Winton company has purchased the interests of its former dealer, the W. D. Howard Motor Car Co., 1238 South Flower street. The Winton branch will continue at the same location in charge of Harry L. Owesney, who also will continue to manage the San Francisco branch.

In Cincinnati the Winton company has taken over the business of L. C. Denison, former Winton dealer at 324-28 West Seventh street, and will continue this establishment as a branch house under the management of Frank H. Walley.

In Chicago the Winton branch house is shortly to remove from its present location at Michigan avenue and Thirteenth street to Michigan avenue and Twenty-fifth street in the building formerly occupied as a branch house of the American Locomotive Co.

E.V.A. Convention in Philadelphia

NEW YORK, April 3—The Electric Vehicle Association of America will hold its fifth annual convention this year in Philadelphia during October, the exact date to be announced later.

The Philadelphia Section, organized during the present administration, now having a membership in excess of 50, secured during its short life of a few months, is planning to make the 1914 convention not only the largest but the most interesting and constructive the association has held.

Notice of Annual Meeting

NEW YORK CITY, April 8—Take notice that the annual meeting of the stockholders of The Class Journal Co. will be held at the office of the company, 239 West Thirty-ninth street, New York City, on Monday, April 20, at 10 o'clock a. m., for the purpose of electing directors and the transaction of such other business as may properly come before the meeting.—E. M. COREY, Secretary.

Makers Against Rail Rate Changes

Object to Assessment of Trackage Charges and Fee for Switching

NEW YORK, April 2—Opposition to any change in freight rates which would discriminate against the automobile, developed at the Board of Directors' meeting of the National Automobile Chamber of Commerce in New York, yesterday, following a report of the traffic committee, in which statement was made that if the suggestion now before the Interstate Commerce Commission is adopted, the railroads will charge automobile manufacturers for spotting or placing of cars on factory sidings, and in addition, trackage charges be assessed on automobile shipments which are not promptly accepted by the consignee. The Chamber has vigorously opposed a new rule suggested by the official classification committee that would prevent combining trucks with passenger machines in making up carload shipments to dealers.

At the manufacturers' meeting, which was presided over by Charles Clifton, it was decided to have the Chamber report at the argument on dunnage allowances before the Inter-State Commission in Washington on April 16.

Trackage Charge Already High

While the suggested charge for spotting or placing cars on factory sidings is planned to cover all commodities, there seemed to be a thought on the part of the railroads to make a special trackage charge against the motor car shipments, because the cars used for such shipments are largely of the 40-foot type, with center doors. On the other hand, such type cars are used for many other commodities, and the manufacturers will strongly oppose any effort to discriminate against the motor cars, the charge on which now is considered very high.

Windsor T. White, of the White Co., and Wilfred C. Leland, of the Cadillac Motor Car Co., were appointed on the Patents Committee, taking the places made vacant by the resignation of L. H. Kittredge, of the Peerless Motor Car Co., and Alvan Macauley, of the Packard Motor Car Co.

The car makers discussed favorably the plan for a National Touring Week, as a time when clubs and trade associations throughout the country could promote events which would interest the owners of cars, and it is not unlikely that after further conference with the Touring Board of the American Automobile Association, a definite date in June will be decided upon.

In attendance at the meeting were: Col. Charles Clifton (Pierce-Arrow), Windsor T. White (White), Hugh Chalmers (Chalmers), L. H. Kittredge (Peerless), Wilfred C. Leland (Cadillac), H. H. Rice (Waverley), Wm. E. Metzger (Argo), S. T. Davis, Jr. (Locomobile), H. O. Smith (Premier), and Alfred Reeves (general manager).

Market Report of the Week

Few changes occurred in this week's market reports. Tin had another drop this week. The steady decline abroad is causing a hesitancy on the part of operators and consumers in this market. The consuming demand is very limited, buyers holding aloof pending a steadier market. The impression prevails that a large speculative interest in the London market is interested in depressing prices to finally get control of the market. Tin closed at $36.70 at a loss of $1.10. The lead market is quiet but firm. The market for copper at the latter end of the week was quiet. Producers are adhering to their offering price of $0.14 3-5 per pound, delivered 30 days for electrolytic refined. Trading, locally, in the rubber markets, showed an absence of new developments of importance, firm price, and a quiet market prevailing.

Material	Wed.	Thurs.	Fri	Sat.	Mon.	Tues.	Week's Changes
Antimony	.05¾	.05¾	.05¾	.05¾	.05¾	.05¾	.....
Beams & Channels, 100 lbs.	1.36	1.31	1.36	1.31	1.31	1.31	.....
Bessemer Steel, ton	21.00	21.00	21.00	21.00	21.00	21.00	.....
Copper, Elec., lb.	.14 9/20	.14⅜	.14⅜	.14⅜	.14⅜	.14⅜	+ .00 3/20
Copper, Lake, lb.	.14⅜	.14⅜	.14¾	.14¾	.14¾	.14¾	+ .00 3/20
Cottonseed Oil, bbl.	7.53	7.49	7.43	7.48	7.47	7.53	.....
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.80	3.80	3.80	3.80	3.80	3.80	.....
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	21.00	21.00	21.00	21.00	21.00	21.00	.....
Petroleum, bbl., Kans., crude	1.05	1.05	1.05	1.05	1.05	1.05	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.74	.74	.74	.74	.74	.74	.....
Silk, raw Ital.	....	5.10	....	....	5.10	5.15	+ .05
Silk, raw Japan	....	4.23	....	....	4.20	4.25	+ .02
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	37.80	38.30	37.20	38.13	37.20	36.70	—1.10
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.04½	.....

NEW YORK CITY, April 2—The United States Rubber Co. has declared a quarterly dividend of 2 per cent. on its first preferred stock, a quarterly dividend of 1 1-2 per cent. on its second preferred stock, and a quarterly dividend of 1 1-2 per cent. on its common stock, payable April 30.

Vacuum Oil Gains 25 Per Cent. in 1913

NEW YORK CITY, April 6—The statement of the Vacuum Oil Co. as of December 31 has been made public, according to which the company's surplus is $2,475,733 larger than in 1912. The net profit for the year is $3,375,773.53. In addition to this, $1,457,156.18 came in from stocks owned in foreign companies. A dividend of 3 per cent. payable in May has been declared. The statement follows:

ASSETS.

	1913	1912
Real estate, machines	$3,501,109	$3,138,907
Mfg. mdse., mat. and stock in process	7,008,885	4,967,604
Cash and debts receivable	12,544,054	12,469,420
Stocks in other companies	11,430,136	11,422,126
Total	$34,484,184	$31,998,057

LIABILITIES.

Capital stock	$15,000,000	$15,000,000
Insurance reserve	100,840	.....
Accounts payable, floating indebtedness	2,232,295	2,322,781
Surplus	17,151,049	14,675,276
Total	$34,484,184	$31,998,057

The real estate and machinery amounts to $3,501,109. This includes the oil plants in Bayonne, N. J., Rochester, N. Y., and Olean, N. Y. The company has stocks amounting to $11,430,136 in other Vacuum Oil branches, distributed throughout the world. The $15,000,000 capital stock is divided among 4,088 stockholders, 1,864 of which are women.

Singer Leases Alco Plant Space

NEW YORK CITY, April 2—The newly-formed Singer Motor Co. the personnel of which is largely made up of ex-employees of the Palmer & Singer Mfg. Co., of Long Island City, has leased a large section of the service building owned by the American Locomotive Co., in Long Island City. Material has been ordered for the experimental cars which are expected to be ready in about a month. In the meantime, a deal is pending for a large completed factory site with convenient railroad sidings. This is also in Long Island City.

Kissel Company Enlarges Hartford Factory

MILWAUKEE, WIS., April 6—The Kissel Motor Car Co. of Hartford, Wis., is about to close its Milwaukee branch works, established 2 years ago, and consolidate all of its productive operations at the main works in Hartford. As the

result of the conclusion of negotiations by the Westinghouse Lamp Co., New York, for the purchase of the former Romadka trunk works at Thirty-second and Center streets, Milwaukee, for its new western branch lamp manufactory, the Kissel company found itself without a plant in Milwaukee and inasmuch as the officers determined some time ago to consolidate operations no further effort was made to secure local accommodations. In consequence, a large addition, providing 60,000 square feet of floor space, is now being constructed at Hartford and will be ready for use as soon as the Milwaukee plant is turned over to the Westinghouse people.

The Westinghouse people expect to produce 20,000 lamps daily and will employ 500 men. The product will include low-voltage lamps for motor car use.

Name Standard Bearing Creditors' Board

PHILADELPHIA, PA., April 6—The creditors' supervising committee of five for the Standard Roller Bearing Co. has been selected. This committee, which will have the power to liquidate the concern at any time should such course seem desirable, is as follows: Joseph Wayne, Jr., W. C. Potter, Herbert Du Puy, J. P. Lee and C. T. Taylor. The general sentiment was to give the receivers a year to put the company on its feet, and if not, to liquidate.

Album of Greetings for Col. Pope

NEW YORK, April 2—There was shipped from New York to Hartford, Conn., yesterday a testimonial consisting of a leather bound book of letters from 1,000 friends of Colonel Pope, in celebration of his seventieth birthday. Colonel Pope, who is treasurer of the National Automobile Chamber of Commerce, reached the age on January 9, during the automobile show at Grand Central Palace, New York, and was presented with a grand-father's clock.

Believing that one of his standing, with so many friends in the bicycle and automobile industries should be further appreciated by something of an original character, a committee, of which S. A. Miles was chairman, proceeded to procure the letters. Each letter is on an individual page, the whole being bound in leather and inscribed:

"To Colonel George Pope, from 1,000 *of his friends."*

The signatures include almost every prominent man now living, who ever had anything to do with the manufacture and sale of bicycles and automobiles, each writer offering his sentiments toward the Colonel.

NEW YORK, April 3—The following concerns have been elected to membership in The Motor and Accessory Manufacturers:

A. O. Smith Co., manufacturers of axles, pressed steel hubs, etc., Milwaukee, Wis.

Detroit Pressed Steel Co., manufacturers of automobile frames and pressed steel parts, 1800 Mt. Elliott avenue, Detroit, Mich.

The Forbes Varnish Co., manufacturers of varnishes, Box 218, Cleveland, Ohio.

The Van Sicklen Co., manufacturers of speedometers, 58 South River street, Aurora, Ill.

The English & Mersick Co., manufacturers of automobile hardware, trimmings, supplies and lamps, 154 Winchester avenue, New Haven, Conn.

Automobile Securities Quotations

There was not much activity in the automobile securities market during the past week. There were few changes in quotation figures outside of ordinary market fluctuation. Goodrich common showed a gain of 4 1-4 and the preferred an increase of 2. This was partly due to the news that the company has taken out a patent which will materially reduce the cost of the manufacture of tires. General Motors preferred gained 1-2 point while the common suffered a slight loss. Goodrich common showed a slump of 5 points but the preferred gained 2. The preferred of this stock has been strong for some time as compared to the common. Kelly-Springfield tire lost 10 points on the preferred and 1 1-2 on the common. This stock has a comparatively narrow market, however, so this is not significant in any way. Lozier common showed a gain of 4 1-2 due to the greatly increased business of the company. Miller rubber went up 3 points more and Peerless common dropped 5 points. The latter stock also has a narrow market. Oils were weak during the past week, Vacuum oil registering a drop of 16 points. Willys-Overland common continues to pick up, having added 2 points. The other changes were slight and were simply market fluctuations.

Security	Wednesday Bid	Wednesday Asked	Thursday Bid	Thursday Asked	Friday Bid	Friday Asked	Saturday Bid	Saturday Asked	Monday Bid	Monday Asked	Tuesday Bid	Tuesday Asked	Week's Change	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co. common	200	..	200	..	200	..	200	..	200	..	200	..	..	150	165
Ajax-Grieb Rubber Co. preferred	99	102	99	102	99	102	99	102	99	102	99	102	..	94	98
Aluminum Castings preferred	98	100	98	100	98	100	98	100	98	100	98	100	..	98	100
Chalmers Motor Co. common	..	83	..	83	..	83	..	83	..	83	82½	88	..	..	..
Chalmers Motor Co. preferred	90	94	90	94	90	94	90	94	90	94	..	83	..	130	140
Firestone Tire & Rubber Co. common	280	285	280	285	280	285	280	285	280	285	280	285	..	272	280
Firestone Tire & Rubber Co. preferred	107	108	107	108	107	108	107	108	107½	109	107½	109	+ ½	60	75
Garford Co. preferred	75	..	75	..	75	..	80	90	80	90	80	90	..	99	101
General Motors Co. common	75½	76¾	75½	76¾	75½	76¾	75½	76¾	75½	76	75¼	76	— ¾	30¼	33
General Motors Co. preferred	94	94½	94	94½	94	94½	94	94½	94	94¼	93½	94½	+ ½	77½	80
B. F. Goodrich Co. common	24	24½	25½	26½	25½	26½	24	24½	26½	27½	26¾	27⅛	+4¼	..	..
B. F. Goodrich Co. preferred	86	88	86	88	86	88	86	88¼	86	88¼	88	88¾	+2	..	..
Goodyear Tire & Rubber Co. common	170	175	170	175	170	175	170	175	165	170	165	170	—5	330	340
Goodyear Tire & Rubber Co. preferred	94	95	94	95	94	95	94	95	95	98	96	99	+2	100	101½
Gray & Davis Co. preferred	90	97	90	97	90	97	90	97	90	97	90	97	..	..	..
International Motor Co. common	..	5	..	5	..	5	..	5	..	5	..	5	..	5	10
International Motor Co. preferred	..	15	..	15	..	15	..	15	..	15	..	15	..	30	40
Kelly Springfield Tire Co. common	58½	60	58½	60	58½	60	59	60	59	60	57	59	—1½	..	..
Kelly Springfield Tire Co. preferred	145	150	145	150	145	150	145	150	145	150	135	140	—10	..	..
Lozier Motor Co. common	14½	..	14½	..	14½	..	15	..	15	..	19	..	+4½	..	..
Lozier Motor Co. preferred	..	65	..	65	..	65	..	65	..	65	..	65	..	..	..
Maxwell Motor Co. common	6½	7	6½	7	6½	7	7	7½	7	7½	7	7½	+ ½	5	10
Maxwell Motor Co. 1st preferred	32½	33½	32½	33½	32½	33½	33½	35	33½	35	34	35	+1½	50	70
Maxwell Motor Co. 2d preferred	11½	12	11½	12	11½	12	13	13½	13	13½	11½	12	..	20	35
Miller Rubber Co.	132	140	132	140	132	140	132	140	132	140	135	140	+3	176	180
New Departure Mfg. Co. common	121	122	121	122	121	122	..	..	..	..	122	123	+1	..	..
New Departure Mfg. Co. preferred	10¢	107	106	107	106	107	..	..	..	..	105	106	—1	..	..
Packard Motor Co. common	102	116	102	116	102	116	102	116	102	116	103	..	+1	..	..
Packard Motor Co. preferred	94	98	94	98	94	98	94	98	94	98	94	98	..	..	..
Peerless Motor Co. common	20	30	20	30	20	30	20	30	20	30	15	..	+5	35	45
Peerless Motor Co. preferred	..	80	..	80	..	80	..	80	..	80	..	75	..	95	100
Pope Mfg. Co. common	1	2	1	2	1	2	2	5	2	5	2	5	+1	17	22
Pope Mfg. Co. preferred	12	16	12	16	12	16	12	16	12	16	12	15	..	54	57
Portage Rubber Co. common	..	30	..	30	..	30	..	30	..	30	..	25	..	38	42
Portage Rubber Co. preferred	..	85	..	85	..	85	..	85	..	85	..	75	..	90	94
*Reo Motor Truck Co.	7	8¼	7	8¼	7	8¼	7	8¼	7	8¼	7	8¼	..	11¾	12¼
*Reo Motor Car Co.	19	20	19	20	19	20	19	20	19	20	19¼	19¾	+ ¼	21	22
Splitdorf Electric Co. preferred	40	50	40	50	40	50	40	50	40	50	40	50	..	..	..
Stewart Warner Speedometer Corp. common	61½	62¼	61½	62¼	61½	62¼	61½	62½	61½	62½	60	61	—1½	..	..
Stewart Warner Speedometer Corp. preferred	99½	102	99½	102	99½	102	98	101	98	101	100	102	+ ½	..	..
Studebaker Co. common	33	34	33	34	34½	35	34½	35	34½	35	34	34½	+1	30	33
Studebaker Co. preferred	86	86½	86	86½	85	87	86	86½	86	86½	85	87	—1	90½	92½
Swinehart Tire & Rubber Co.	60	67	60	67	60	67	60	67	60	67	60	65	..	92	95
U. S. Rubber Co. common	62¼	62½	62¼	62½	61¼	61½	62¼	62½	62¼	62½	61	61¼	..	66½	66¾
U. S. Rubber Co. 1st preferred	103	104	103	104	104	104½	103¼	104¼	103¼	104¼	104	104½	+1	108	108½
†Vacuum Oil Co.	246	250	246	250	245	249	240	243	240	243	230	233	—16	..	..
White Co. preferred	107	110	107	110	107	110	107	110	107	110	107	110	..	107½	109
Willys-Overland Co. common	63	66	63	66	63	66	65	67	65	67	65	67	+2	64	69
Willys-Overland Co. preferred	89	94	89	94	89	94	89	94	89	94	89	94	..	92	98

*The par value of these stocks is $10; all others $100. †Ex. div.

Seider Reorganizes R-C-H; New Car To Sell at $900

Debts of Old Company Not Assumed—Old R-C-H Features Continued—Body Design Different

DETROIT, MICH., April 4—The R-C-H Corp., in this city, has been taken over by Charles P. Seider, who connected himself with this company when the creditors first took charge and who later entered into a contract with the Todd-Frank-Friedeberg Co., to continue the business. Mr. Seider has been elected president of the reorganized company, which has already announced a new R-C-H to sell, fully equipped, at $900. This new model is being put through in quantities and is characterized with a streamline body, cowl dash, sloping hood, rounded cellular radiators, windshield, top, Jiffy curtains, etc. The many features of the old R-C-H have been continued and numerous improvements added.

Albert H. Collins, former Michigan and Indiana R-C-H distributer, who associated himself with Seider early in the present year, has been elected vice-president and assistant general manager. Seider is to act as general manager. Albert F. Edwards, vice-president, in charge of purchases of the Detroit United Railway and a director of the Union Trust Co., has been elected secretary and treasurer. These men, together with Henry Russel, general counsel Michigan Central Railway, and Burnham S. Colburn, director of the People's State Bank, Union Trust Co., of Detroit, and the Canadian Bridge Co., of Canada, form the board of directors.

The new company is in no way connected with the old corporation and in taking over the property has not assumed any of the old corporation's debts or obligations.

The new R-C-H car is quite different in appearance from the old one. It has a full streamline body, built on a wheelbase of 110 inches. The motor has four cylinders cast in a block, the bore and stroke being 3¼ inches and 5 inches, respectively. In the cars for domestic use the steering gear will be at the left side; export cars will have right steering, unless otherwise specified. The essential elements in the transmission include cone clutch, three-speed selective gearset and semi-floating rear axle. Tires measure 32 x 3½ inches.

Two body types will be produced, one affording accommodations for five passengers and the other a two-passenger roadster. Equipment will be complete and includes electric headlamps fed from a storage battery, Sears-Cross speedometer, demountable rims, windshield, top with Jiffy curtains and the usual complement of tools, etc.

Among the dealers already closed are:

W. D. Havens, Schenectady, N. Y.; I. D. Lundy, Utica, N. Y.; Davis & Turney, Dallas, Tex.; E. W. Grobe, Stonewall, Tex.; I. W. Short, Taunton, Mass.; Geo. M. Ives, Fulton, N. Y.; A. E. Lawyer, Watertown, N. Y.; Willard Morris, Dansville, N. Y.; E. W. K'Burg, Toledo, O.; Orville Dennis, Lake City, Mich.; Jolly's Motor House, Adelaide, South Australia; Cephas Whitney, Georgetown, British Guiana, South America; L. W. Lamb, Terry, Mont.; Menomonie Auto Co., Menomonie, Wis.; Fred Feene, Freeborn, Minn.; Wallace & Donnelly, Jamestown, N. D.

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Richard Auto Mfg. Co. Formed

CLEVELAND, O., April 8—The Richard Auto Mfg. Co., this city, has been incorporated by Francois Richard, F. M. Brady and others, to produce a car using gasoline or kerosene. The company maintains that the carbureter is efficient with either fuel. It is listed to sell, fully equipped, at $1,850. The company claims that the car will go 26 miles on 1 gallon of gasoline and that it will take a 10 to 15 per cent. grade on high speed at 50 miles an hour, its gearing being 2. to 1.

It has a long-stroke motor, rated at 25 horsepower, and claimed to develop 96. It is of the four-cylinder type with 4-inch bore and 8 15-16-inch stroke. It has a 128-inch wheelbase and a seven-passenger touring car body. A magnetic electric starting and lighting system is used.

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Sphinx To Make Light Car in York

DETROIT, MICH., April 7—York, Pa., is to be the location of the Sphinx Motor Car Co. which has been formed by H. R. Averill, for 7 years sales manager of the Pullman Motor Car Co., and which is backed by interests in eastern Pennsylvania and Baltimore, Md., in addition to Mr. Averill.

The first car is being manufactured in this city and reveals striking lines and constructional features for a light car. It is designed to sell between $600 and $700 fully equipped. The motor is a 3 3-8 by 5 block type of the L-head design and is cooled by thermo-syphon. It is said to develop 30 horsepower.

The axles are Weston-Mott and the gearset is located on the rear member and affords three forward speeds. The driveshaft is inclosd while cantilever springs support the pressed steel frame front and rear. A brand new feature in motor car construction is the location of the change gear lever and the emergency brake lever on brackets attached to the front end of the torsion tube. This is done instead of having a separate cross piece to carry these levers.

Other specifications of the Sphinx are wire wheels, worm and sector steering gear, 110-inch wheelbase, 10 1-2-inch clearance and standard tread. Two body styles are contemplated, a roadster and a five-passenger type.

The five-passenger car weighs under 1,800 pounds equipped. Remy electric equipment is to be used.

Mr. Averill states that about 1,000 cars are planned for the rest of the present year, but in another year production will be stepped-up in accordance with the demand.

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General Vehicle To Start English Branches

NEW YORK CITY, April 8—E. W. Curtis, Jr., metropolitan district manager of the General Vehicle Co. and vice-president of the Motor Truck Club, sailed yesterday afternoon on the Mauretania for a 3 months' business stay in England, where he will establish agencies for his company's electric vehicles. Mr. Curtis has resigned as New York district manager of this company and D. C. Fenner, former sales manager of the U. S. Motor Co., and later metropolitan sales manager for the International Motor Co., succeeds him.

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Dealers' Business Demonstration

NEW YORK CITY, April 8—The Motor Dealers' Contest Assn. of this city, has decided upon holding an automobile business demonstration on April 23 and 24 through that part of New York and Connecticut which is included in the selling territory of New York dealers. The demonstration is to be a business booster movement in which different dealers will enter their different models of cars and make a circuit through the territory, stopping for 1 hour or longer at the important centers where sub-dealers will have a chance of showing all the different models which they may not be able to carry in stock.

The itinerary is not definitely decided yet, but the first night's stop will be at Hartford, Conn., and noon stop the following day at Poughkeepsie, N. Y. Chairman E. Lascaris, whose committee has charge of the demonstration is planning similar business demonstrations through Long Island. Accessory concerns will be invited to participate.

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Tennant Resigns from Stewart-Warner

NEW YORK CITY, April 8—W. G. Tennant, vice-president of the Stewart-Warner Speedometer Corp., has resigned to take effect May 1, after which date he will devote his entire attention to Tennant Motors, Ltd., Chicago, dealer in Simplex, National, Abbott-Detroit and Briscoe cars. During his connection with the Stewart-Warner Corp. Mr. Tennant had charge of all sales outside of speedometers.

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Studebaker Re-Elects Directors

NEW YORK CITY, April 8—At the annual meeting of the Studebaker Corp., held in this city, the old directors were re-elected. At the organization meeting, A. G. Rumpf, who has been in charge of the company's credit department for some years, will be elected secretary to succeed Scott Brown, who has resigned to resume private law practice.

The following are the directors re-elected for the ensuing 3 years: E. Barton Hepburn, Henry Goldman, E. R. Benson, Phillip Lehman, and D. M. Weeks.

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Chicago Makes Sensible Headlight Rule

CHICAGO, ILL., April 8—This city after wrestling with the headlight-glare problem on the city streets has, after much experimenting by its technical committee appointed some months ago to investigate the different non-glare devices, passed a by-law in which the city creates a commission to pass on all makes of headlights and non-glare devices which will have to be submitted by manufacturers for approval for

use in the city. Types of headlights which gain the approval of the commission will be officially listed and certificates issued for that particular type of lamp and in this way any lamp company may have any type of lamp passed on and so free the individual car owners from any trouble or responsibility. The ordinance is to be put into force at once.

The technical committee, which has been studying the problem, conducted a series of tests on various devices, these tests being witnessed by the Mayor, the Chief of Police, and other city officials. Automobile interests were also represented. These tests did not provide definite information from which a satisfacory ordinance could be drafted and the present commission has been considered the only workable solution.

The new ordinance represents the most rational attempt to solve the headlight problem that has been made. Recognized as an engineering problem the matter has not been left to politics, but through the Efficiency Bureau has been handled in a scientific manner. The result is an ordinance which will work hardship on no one, will establish standards to work from, and as a basis for complaint, and which will make the boulevard traffic of the city especially safer and more comfortable. It is not intended to rob the car of its driving light, this is necessary in Chicago, but to so arrange that driving light that it shall not glare in the eyes of the pedestrian nor in the eyes of the approaching motorist.

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Yellow Lights Lawful in Milwaukee

MILWAUKEE, WIS.—Yellow or amber colored glass, which eliminates the rays of light that cause the blinding or dazzling effect of the average motor car headlight, will henceforth be permitted for use in Milwaukee under an amendment to the recently enacted ordinance framed by the Milwaukee Automobile Club for the purpose of eliminating blinding headlights within the city limits. The original ordinance reads that no vehicle may carry headlights, the main or direct rays of which shall strike the roadway more than 200 feet from the base of such vehicle on a horizontal roadway. To prevent the use of navigator's lights, the ordinance included a provision that none but white lights could be carried on the front of any vehicle. Scientists came forward with the proposition that yellow or amber-colored glass was even more efficient for preventing glare or dazzle.

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Reuss Now Los Angeles Stearns Agent

LOS ANGELES, CAL., April 6—W. R. Reuss has assumed complete control of Stearns-Knight business in Los Angeles and surrounding territory, carrying a complete line of cars and a large stock of parts. In addition, the Stearns factory will keep a factory man at his place of business, 1000-02 South Olive street.

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16,782 Miles Wins Tire Contest

NEW YORK CITY, April 6—The winner of first prize of $500, in the mileage contest of the Ajax-Grieb Rubber Co. is J. F Gibney, driver of a Locomobile for C. E. Rock, of Marlboro, Mass. This chauffeur got 16,782 miles out of the casing.

The following is the record of the ten highest mileages in the contest:

1—Locomobile; driver, J. F. Gibney, Marlboro, Mass.; owned by C. E. Rock; 16,782 miles.
2—Packard; driver, Fred Dickas, Detroit, Mich.; owned by G. D. Coleman; 13,900 miles.
3—Cadillac; driver, W. Mann, Victoria, B. C.; owner, Canadian Northern Pacific R. R.; 13,761 miles.
4—Ford; driver, Darwin Aldrich; Littleton, N. H.; owned by G. D. Clarke; 12,983 miles.
5—Ford; driver, Richard Grenfell, Ironwood, Mich.; owned by A. I. T. M. Co.; 12,400 miles.
6—Peerless; driver, W. H. Bodine, New York City; owned by Bryant Motor Service Co.
7—Pierce-Arrow; driver, A. Nelson, Brooklyn, N. Y.; owned by W. I. Jones; 12,100 miles.
8—Michigan 40; driver, H. Vonder Hyde, Jacksonville, Fla.; owned by Oscar Sewald; 11,665 miles.
9—Packard; driver, John Smith, Brooklyn, N. Y.; owned by Frank Bailey; 11,500 miles.
10—Pierce-Arrow; driver, E. J. Byron, Littleton, N. H.; owned by G. A. Tilton; 11,372 miles.

The rules of the competition were as follows: The Ajax Grieb Co. will provide blanks for those who enter the competition. The blank will require that there be reported the size of the tire, the make of the car on which it is to be used, the date of purchase, the date on which the tire is put in service, the serial number of the tire, the speedometer reading, and where the tire is bought. This is to be signed by the employer of the chauffeur and the information will be copied on cards at the place where the tire is bought.

To complete the competition notification will be made when the tire has ceased its usefulness, the date when it was removed from the car, the speedometer reading and the number of miles covered by the car. This is all to be signed by the owner and returned within five days after the tire has been taken out of service. Any number of tires for one chauffeur count in deciding the contest.

Alfred Reeves, M. L. Scudder and R. A. Patterson were the judges.

Profits of Rubber Goods Co. Shrink $438,533 in 1913

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Declining Market and Diminishing Prices Affect Earnings of Five Subsidiary Tire Companies

NEW YORK CITY, April 7—The annual statement of the Rubber Goods Mfg. Co., which is a holding company, controlling five subsidiaries, namely, G. & J. Tire Co., Morgan & Wright Tire Co., Hartford Rubber Works, Mechanical Rubber Co. and the Peerless Rubber Mfg. Co., for 1913 shows net profits of $2,325,954, which is $438,533 less than the net profits for 1912, a reduction explained by President Williams in his annual report as due to a declining market and a very sharp reduction in prices.

This decline in prices naturally reduced the total prices of goods sold during 1913, which are figured at $35,640,365, as compared with $36,147,332 for the previous year, this making a reduction on the net sales of $506,967. Concerning the net sales, President Williams in his report says:

"The quantity of goods sold compares very favorably with previous years. The total net sales of our product were $35,640,365, and the tire sales included in this total not being the deliveries of the factories to the U. S. Tire Co., but a proportion of the U. S. Tire Co.'s actual sales based on deliveries."

The assets of the company, as shown by the balance sheet, total $55,968,056, which is largely plants, inventoried at approximately $32,000,000. The liabilities total $47,392,547, leaving a surplus of $8,575,509.

In speaking further to the stockholders in his annual report, President Williams says: "As our tire manufacturing subsidiaries required a larger amount of working capital, 6 per cent. preferred stock of certain tire companies was issued during the year to an amount aggregating $1,300,000, the same being subscribed by the U. S. Rubber Co. The Morgan & Wright plant has been enlarged during the season, this work now being almost completed."

The complete statement, covering the finances of the Rubber Goods Mfg. Co., follows:

Consolidated income account of Rubber Goods Manufacturing Co. for year ended Dec. 31, 1913, compares:

	1913	1912	1911	1910
Net sales	$35,640,365	$36,147,332	$34,587,269	$35,188.295
Net profits	2,325,954*	2,764,487	3,500,997	2,122,247
Bond redemption, etc...	15,817	15,872	46,543	75,589
Dividends	*2,462,518	2,280,601	2,159,762	989,994
Surplus (def.)	152,381	468,014	1,294,692	1,056,664
Previous surplus	8,728,891	8,260,877	6,558,531	5,501,867
Transfer from reserve...	.....	.....	407,654	.....
Profit and loss surplus..	8,576,510	8,728,891	8,260,877	6,558,531

*Includes $43,750 paid minority interests in one subsidiary company.

The consolidated general balance sheet of Rubber Goods Manufacturing Co. and subsidiaries compares as follows:

ASSETS.	1913	1912	1911
Plant and investment	$31,908,176	$29,541,886	$28,173,486
Inventories	8,109,176	8,636,293	10,495,130
Cash	3,086.753	2,407,332	2,043,593
Bills and accounts receivable	9,958,320	12,634,719	6,915,644
General Rubber Co. stock	1,666,700	1,666,700	1,666,700
Securities owned	384,030	384,030	383,450
Sinking fund	422,541	382,759	.....
Miscellaneous assets	432,357	444,396	292,136
Total	$55,968,056	$56,098,118	$49,970,141
LIABILITIES.			
Preferred stock	$10,351,400	$10,351,400	$10,351,400
Common stock	16,941,700	16,941,700	16,941,700
Capital stock subsidiaries	1,337,500	.....	.....
Bonds subsidiaries	953,000	1,005,500	*672,289
Reserve for retiring bonds	382.295	423,348	454,326
Bills and accounts payable	8.846,747	8.354.395	7,164,541
Accts. payable to General Rubber Co.	5,938.105	7,752,724	.....
Reserve for accidents	89,725	40,940	34,434
Reserve Federal income tax	51,853	.....	.....
Fixed surplus (subsidiary companies)	2.499,218	2.499.218	2,499,219
Surplus	8,576,509	8,728,891	8,260,877
Total	$55,968,056	$56,098,118	$49,970,141

*After deducting sinking fund cash in hands of trustees.

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MUNCIE, IND., April 4—The B-T-K Gear & Engine Co., Muncie, Ind., which a short time ago was incorporated under Indiana laws has taken over the business, stock, liabilities and patents of the Auto Parts Mfg. Co., and hereafter will specialize in transmissions, and on a new engine of which details have not yet been divulged.

Glidden Trophy Is Certain for Chicago-Boston Run

A. A. A. and C. J. Glidden Willing To Cede Prize for Contest—New Stock Car Rule Proposed

CHICAGO, April 6—Negotiations carried on by the Chicago Automobile Club with the American Automobile Assn., relative to the securing of the Glidden trophy for the proposed Chicago-Boston day and night non-motor stop run have progressed so far that it almost is a certainty that the historic cup will be turned over to the local organization without any strings tied to it, and that the Chicago-Boston affair will be a national tour, marking the return of the Glidden to the strictly contest field.

The American Automobile Assn. has informed the Chicago Automobile Club that it is willing that the Glidden trophy should be turned over and C. J. Glidden himself has agreed to it. It also is agreed that the Chicago club shall have complete control of the tour and that there shall be a stock car class. The only possible hitch has to do with the stipulation made by Glidden that the terms of the "regular deed of gift" shall be adhered to. There seems to be a misunderstanding here. It is not known whether or not the donor means that it shall be a team prize run under the same conditions as last year's Glidden. If so, there is likely to be some delay in straightening out the tangle.

It is proposed to have the run start from Chicago July 1 in order to have the finish at Boston just in time to permit those of the contestants who desire to continue on to Bretton Woods for the mid-summer meeting of the American Automobile Assn.

That this contest will bring about the return of the stock car rule seems certain now. Acting on instructions from the A. A. A., David Becroft, representing the A. A. A. contest board, and Alfred Reeves, general manager of the National Automobile Chamber of Commerce, have prepared the draft of a new stock car rule which will be submitted to the A. A. A. contest committee at a meeting which is to be held in New York Thursday.

A. A. A. Touring Week June 27-July 4

NEW YORK CITY, April 8—Chairman Frank X. Mudd, of the A. A. A. Touring Board has declared the week beginning Saturday, June 27, and concluding Saturday, July 4, as the official touring week for 1914. It will be accentuated by a night and day run from Chicago to Boston and its conclusion will be marked by the mid-summer semi-annual meeting of the association to be held at Bretton Woods in the White Mountains. A year hence the scene will shift to the Pacific Coast, with San Francisco as the terminus.

Chairman Richard Kennerdell and his Contest Board are at work on the stock car rules that will govern the Chicago-Boston event, the principal prize in which will be the famous Glidden trophy.

In connection with the various tours to the White Mountains, the beautiful A. A. A. National touring trophy and the Anderson cup donated by the South Carolina city of that name, will be offered in competition under rules that have yet to be formulated and announced by Chairman Mudd.

DePalma Enters Vauxhall in Grand Prix

NEW YORK CITY, April 8—Ralph DePalma accepted by cable yesterday, an offer to drive a Vauxhall car in the French Grand Prix automobile race, which will be run July 4. He will sail June 4 to tune up the car, a British make. He will probably participate in a race meet on the Brooklands track before the big race. The Vauxhall he will drive is a four-cylinder machine, with four valves in each cylinder, actuated by an overhead camshaft. It comes inside the 300 cubic inches piston displacement limit, being 3.93 by 5.51. It is figured to show 110 horsepower at 2,500 revolutions a minute. The car weighs under 2,500 pounds.

Stutz and Mercer Reduce Indianapolis Entries

INDIANAPOLIS, April 6—Anticipating an overflow field in the next 500-mile race, Stutz and Mercer have each withdrawn cars from their teams of three and sold them to private owners, with the guarantee that they re-enter them again. Bob Maypole, of Chicago, is to be official sponsor for the former, piloted by Oldfield, and Walter A. Almy, of Trenton, N. J., for the latter, handled by Pullen.

The manoeuver of the pair was inspired by the fear that the speedway rule requiring the reduction of three-car teams to two before the final cut to thirty would operate to their disadvantage. By entering the third car separately they think they will be able to avoid this complication.

The ultimate complexion of the sweepstakes field will thus be determined on the basis of speed alone, the thirty fastest cars surviving. No fourth car of any one make, can compete, of course, due to an A. A. A. ruling on the subject. This method of selection, it is thought, will give the best balanced and fastest group of starters in any contest since the world began. All records are expected to go.

Mulford Enters Mercedes in Speedway Race

INDIANAPOLIS, IND., April 7—Ralph Mulford has entered the Indianapolis 500-mile race at the wheel of the Mercedes he drove into seventh place in last year's contest. He made this move after having his entry of the Peugeot with which Goux finished first in 1913 rejected because three cars of that make had already been nominated. Mulford may gut the Peugeot of its motor and install it in the Mercedes. E. C. Schroeder, the Jersey City lamp manufacturer and owner of the car, is trying to get the A. A. A. to revise its three-car rule so as to permit the carrying out of his original intentions.

Joe Dawson, in the winning 1911 Marmon, has been entered in the race by Charles Erbstein, a Chicago attorney. The entry of the Marmon boosts the speedway entry list to twenty-one as follows: Burman: Burman, and one other; Stutz: Oldfield, Cooper and Anderson; Gray Fox: Wilcox; Beaver Bullet: Keene; Peugeot: Goux, Boillot and Duray; Sunbeam: Chassagne; Delage: Guyot, and Thomas; Excelsior: Christiaens; King: Klein; Mercer: Wishart, Pullen and Bragg; Mercedes: Mulford and De Palma, and Marmon: Dawson.

Cyclecar Pilgrimage to Speedway Races

DETROIT, MICH., April 4—A huge demonstration is being arranged by the cyclecar clubs of the Middle West, to take place at the time of the Indianapolis 500-mile race. The Detroit Cyclecar Club, of which F. Ed. Spooner is president, will call its first official run to Indianapolis going via South Bend, at which point the Chicago Cyclecar Club will join the tour. The Hoosier Motor Club of Indianapolis will tour out of Indianapolis May 29 to meet the Detroit-Chicago tourists and escort them into the city where the cycle, light and small cars will be seen in a parade. The procession will then park its cars, probably at Monument Circle, so that they may be seen. It is believed that hardly less than fifty and probably one hundred cars will take part.

Trenton Celebrates Mercer Victory

TRENTON, N. J., April 6—Edwin Pullen, who won the Grand Prize race in Santa Monica on February 28 with a Mercer car, drove the race all over again last Saturday, but it was an entirely different kind of a race. For the entire distance of approximately 6 miles he headed the procession engineered by the Mercer Automobile Co. to celebrate Pullen's victory and the whole city turned out to see the plucky driver and "Andy" Vollman, his mechanician. All told, there were upward of 250 cars in the parade. Most of them were decorated and there were prizes for the best decorated ones in several classes. In the roadster class, first prize, a $50 silver cup, went to H. Le Roy Stout who drove a Mercer roadster converted into a great white float upon which was mounted a golden replica of the Grand Prize Cup. The celebration was brought to a close with a smoker given by the Mercer company to its employees and a number of invited guests. The only regrettable incident was that after half of the program had been completed the police officials decided that the New Jersey laws would not permit boxing exhibitions. Hence, it was necessary to abbreviate the program.

Gala Week for Brooklyn Trade

BROOKLYN, N. Y., April 6—While Brooklyn will not have an automobile show this year, there will be a Gala Week among the local automobile dealers, the last week in April, and all the show rooms will be decorated and have displays. The matter was settled definitely recently at a meeting of the Brooklyn Motor Vehicle Dealers' Assn.

Factory Miscellany

RACINE CO.'S $50,000 Plant—A $50,000 factory building to be devoted exclusively to the production of closed bodies will be erected at once as an addition to the large works of the Racine Mfg. Co., Racine, Wis., one of the largest producers of motor car bodies in the country. The company recently started a campaign for closed body business and the results have been overwhelming the present facilities. The new building will be four stories high, 100 by 281 feet in size, of fireproof construction. It will occupy the corner of Eighth and Mead streets, which is part of the site of the old Racine Mfg. Co. shops, which were destroyed by fire in December, 1910, with a loss of $750,000. The plant has gradually been rebuilt and with the new building will be much larger than the former plant.

Luzerne Rubber Co.'s Addition—The Luzerne Rubber Co., Trenton, N. J., is having plans prepared for an addition, 40 by 80 feet, two stories high, and brick construction.

Apple Top Co. Builds—Plans have been completed by the Apple Auto Top Co., Miamisburg, O., for a new factory to be erected on Smith street. The structure will be two stories high and 250 feet in length.

Washington Co. Moves — Probey-Haynes Motor Co., Washington, D. C., agent for Haynes, Briscoe, Westcott and Davis, has removed from 1230 Wisconsin avenue to larger quarters at 1223 New York avenue.

Grant Makes London Shipment—The Grant Motor Co., Findlay, O., made its first shipment of its little runabout to London, the order being for six. The plant is now running 130 men, and within 2 months the number will be increased to 200.

Gould Battery's New Building—The Gould Storage Battery Co., a $6,000,000 corporation, of New York, is preparing to extend its operations in Cleveland and has leased the new building at 1761 E. 18 street, Cleveland, O., for use as a branch house.

Utility Motor's New Plant — The Utility Motors Corp., of Chicago, has secured a new factory location at Plymouth, Ind., and has commenced the shipment of machinery there for installation. The concern manufactures automobile engines.

Fiat Employing More Men—With the advent of spring, the F. I. A. T. Co., Poughkeepsie, N. Y., is increasing its force of workmen. At no time during the winter, John Lurie, the general manager, stated, have there been less than several hundred men in the employ of the company.

Will Manufacture Tools—The Keller Pneumatic Tool Co., of Fond du Lac, Wis., organized recently, has commenced the manufacture of a line of compressed air tools of all kinds and will make a specialty of garage and repair shop devices. Julius Keller is president and general manager of the company.

Cleveland Cyclecar May Build—The Cleveland Cyclecar Co., which has a factory at Luther avenue and E. 59 street, Cleveland, O., has been incorporated with a capital of $200,000. The company expects to erect a plant of its own. The incorporators are Attorney Charles Savage, William H. Noyes, Robert Clarke, Frank H. Schmidt and W. E. Burns.

Hartford Increases 32,000 Sq. Ft.—The Hartford Auto Parts Co., Hartford, Conn., which occupies a part of the Colt's Armory, is making rapid advances, and finds it necessary to increase the floor space to 32,000 square feet. The working force has been increased 48 per cent. For the past 10 days the plant has been in operation day and night.

Two Offers for Columbus Buggy Plant—Two offers have been received by the creditors' committee of the Columbus Buggy Co., Columbus, O., for the purchase of the plant and all of the assets, but so far no deal has been made. Both of the offers look towards the continuation of the plant as a going concern for the making of automobiles. There will be a meeting of all of the creditors of the concern April 15, when the matter will be considered.

Case Co. with Full Force—The J. I. Case T. M. Co., of Racine, Wis., an $80,000,000 corporation, well-known as a manufacturer of motor cars, tractors, etc., has resumed operations on a full schedule after operating short hours and with reduced forces for several months. The company employs nearly 5,000 men in its various shops at Racine. All the employees that were laid off have been given employment once more and the usual schedule of workdays resumed.

Gramm Plans Additions—The Gramm-Bernstein Co., of Lima, O., manufacturer of motor trucks, is planning the building of several additions to the present plant. A building will be erected at once for the painting and assembling departments. This structure will be 48 by 110 feet and will be of steel and concrete construction. The building of the proposed new brick highway along Metcalf street, will materially aid the plant of the Gramm company, as it will give an outlet to the plant. According to General Manager E. A. Williams, Jr., the working force of the plant has been increased by 50 per cent. since the first of the year.

Donates Land to Aluminum Co.—To assist the Aluminum Goods Co., of Manitowoc, Wis., to make much-needed additions, the Citizens' Assn., Manitowoc, Wis., has donated two city lots to the company as a site for extensions. The lots originally were purchased by the association with the idea of donating them to the Aluminum Castings Co., which closed up its Manitowoc foundry on account of alleged poor labor conditions in Manitowoc during the negotiations. The castings company shops have resumed operations after a lapse of several months, but the offer of the lots was not renewed.

Ford Assembled in 38 Minutes—A Ford automobile was assembled, painted, varnished and run out on the floor ready for shipment in 38 minutes recently for the benefit of 200 members of the Brooklyn Society of Engineers and their guests at the Ford factory in Long Island City. This included gathering all the parts, putting them together, upholstering the body and putting on all the accessories, windshield, top and speedometer. Bolts were tightened by electricity, saving time estimated to be worth the setting up of two or three more machines a day, while the paint was sprayed on and the varnishing done by what is termed a flowing process.

The Automobile Calendar

April 7, 8, 9	New York City, S. A. E., Standards Committee Meeting.
April 8-11	York, Pa., Automobile Show, Coliseum.
April 9-15	Manchester, N. H., Automobile Show.
April 12-19	Prague, Austria, Eleventh Annual International Auto Exhibition, Royal Tiergarten.
April 21	New York City, S. A. E., Research Division Meeting.
May 5	New York City, S. A. E., Electrical Equipment Division Meeting.
May 12	New York City, S. A. E., Ball and Roller Bearings Division Meeting.
May 14	New York City, S. A. E., Motor Testing Division Meeting.
May 25-26	Palermo, Sicily, Targa Florio, 700-Mile Race.
May 28-30	Chambersburg, Pa., Trys over Lincoln Way from Chambersburg to Pittsburgh, Chambersburg Motor Club.
May 30	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 1	Palermo, Sicily, Coupe Florio, 279-Mile Race.
June 17-18	Fayette Co., Pa., Second Annual Hill Climb, National Pike.
June 18	Uniontown, Pa., Hill Climb, Auto Club of Fayette Co.
June 23-26	S. A. E. Summer Meeting, Cape May, N. J., Cape May Hotel.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
June 30	London, Eng., Fourth International Rubber and Allied Industries Congress.
July 3-4	Tacoma, Wash., Road Races, Tacoma Carnival Assn.
July 4	Sioux City, Iowa, 300-Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 21-22	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Sept. 26-Oct. 6	Berlin, Germany, Automobile Show.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
November	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.
November 8-11	Shreveport, La., Track Meet, Shreveport Auto Club.
November 15	Paris, France, Kerosene Motor Competition.

The Week in the Industry

Motor Men in New Roles

FISCHER Spark Plug Assn. Secretary—J. Wm. Fischer, Jr., is secretary of the new Spark Mfgs. Assn. He is the sales manager of the Silvex Co., maker of the Bethlehem plug. Mr. Fischer's office is at 60 Wall street, New York City.

Piper Resigns—J. C. Piper has resigned as president of the Piper Machine Works, Indianapolis, Ind.

Wadsworth Goes Abroad—George W. Wadsworth, engineering manager of the Gray & Davis Co., has started on an extensive Europeon trip.

Moon Goes to Chicago—E. J. Moon, former eastern sales manager for the Moon Motor Car Co., St. Louis, Mo., has taken charge of the Chicago branch.

Tooley Resigns from Oakland—F. A. Tooley, who has been general auditor of the Oakland M. C. Co., Pontiac, Mich., for the past 2 1-2 years, has resigned.

Dickens Resigns from Case—J. M. Dickens has resigned from the J. I. Case T. M. Co., Racine, Wis., to assume the position of sales manager of the Advance Mfg. Co., Racine.

McKay Goes to 'Frisco—Donald McKay, formerly manager of the Seattle branch of the Diamond Tire Co., has joined the San Francisco branch of the Diamond company.

Sanders Comes to Boston—L. B. Sanders, well known in Detroit motor circles, has been sent to Boston as manager of the New England branch of the Oakland, succeeding William T. Fewell.

Hawley Now Manager—Philip Hawley, formerly manager of the New England branch of the Studebaker Co., has been appointed manager of the Boston branch of the King Motor Car Co.

Dansie G. M. C. Manager—C. W. Dansie has again returned to the Seattle field, and during the past week accepted the managership of W. H. Barnes & Son, G. M. C. motor truck distributors.

Metz Goes West—Edwin H. Metz, son of President Metz of the Metz Automobile Company, of Waltham, Mass., has been appointed manager of the new branch established by the factory at Los Angeles, Cal.

Sanders Heads Boston Oakland—L. B. Sanders, lately connected with the Abbott Motor Car Co. in the capacity of general sales manager, has been appointed manager of the Boston, Mass., Oakland branch.

Schott with Marathon Tire—L. J. Schott, who has been chief of the Swinehart service department for several years, has resigned to take a position with the Marathon Tire & Rubber Co., Cuyahoga Falls, O.

Rose Manager—Alex. Rose has become Berkshire county branch manager for the E. V. Stratton Co., Albany, N. Y., with headquarters in Pittsfield, Mass. The Stratton company has the Hudson and Stewart.

Woman Now Manager—Miss Ruth Sarkin, the first woman to secure a license to operate a car in Fitchburg, Mass., is now manager of the largest garage in that city and she is also a half owner of the business.

Wilkinson Now Manager—George A. Wilkinson has been placed in charge of the business of the Rutland, Vt., Garage Co., by the stockholders to succeed L. A. Perkins, who resigned to go to Montpelier to go into business for himself.

McEllherren, Manager—L. H. McEllherren, who was with the Seattle, Wash., branch of the Firestone Tire & Rubber Co. for several years, has been named manager of the automobile supply department of the Ernst Hardware & Plumbing Co.

Gregg Lincoln Sales Manager—Elmer Gregg, former secretary and general manager of the Penn Motor Car Co., has taken the position of general sales manager of the Lincoln Motor Car Co., Detroit, which is to market a light car to sell at $600.

Mitchell Heads Boston Branch—The United States Mill Supply Co., of Providence, has made arrangements to open a branch in Boston for the Mais truck. Walter L. Mitchell, formerly with the Packard and the Mack companies, has been made manager.

Heaney Heads New Co.—A. P. Heaney, former head of the Heaney Automobile Co., Minneapolis, Minn., has been made manager of the La Crosse Auto Co., 921 Hennepin avenue. C. C. Jacks, well-known automobile dealer, has joined the same company.

King Resigns—After a period of 7 years' service as sales manager and assistant general manager of the Keats Auto Co., Portland, Ore. C. H. King has resigned, and will take charge of the sales end of the Coin Machine Manufacturing Co. in Portland.

Butterfield Kissel-Maxwell Manager—The Butterfield Motor Car Co., Fairchild, Wis., has taken possession of the building recently vacated by the Fairchild Motor Co. The new concern will represent the Kissel and Maxwell lines. Ed. H. Butterfield is manager.

Burneson with Gramm — Thomas Burneson, formerly manager of the Kline Motor Car Co.'s branch in York, Pa., has become district manager for Gramm Motor Truck Co., and will be in charge of the Pennsylvania and Maryland territory with headquarters in York.

Reid in Racine Co.—John Reid, Jr., of New York, son-in-law of Frank K. Bull, president of the J. I. Case T. M. Co., Racine, Wis., has been elected secretary and general manager of the Belle City Mfg. Co., Racine, in which Mr. Bull is principal stockholder and president.

Phillips in New Co.—C. W. Phillips, for years Northwest manager for the Edison laboratorial products, has purchased an interest in the H. L. Keats Auto Co., of Seattle and Portland, and has taken charge of the Seattle agency for the Chalmers, Saxon, Selden and Peerless.

Ten Brook Oakland Manager—General Sales Manager Fred W. Warner of the Oakland Motor Car Co., announces the appointment of A. P. Ten Brook as manager of the Kansas City., Mo., Oakland branch. Mr. Ten Brook was associated with Mr. Warner in Chicago as sales manager of the Buick branch.

Howard To Build Trucks—Robert G. Howard, formerly manager of the Vulcan and Bessemer branches in Boston, has resigned to devote his time to the production of a new light truck he proposes to build that is to have a four-cylinder motor, 22 horsepower, shaft drive, capable of carrying from 1,000 to 1,500 pounds.

Swartz Resigns from Pullman—Edward Swartz, until recently purchasing agent for the Pullman Motor Car Co., of York, Pa., has resigned to accept the local agency for the Saxon car. Mr. Swartz will be succeeded by H. F. Koller, formerly in charge of the purchasing department of the Kline Motor Car Corp., Richmond, Va.

Spindler in New Capacity—Walter Spindler, of Manitowoc, Wis., has been elected secretary and treasurer of the Manitowoc Aluminum Specialty Co., Manitowoc, Wis., having taken an important financial interest in the concern, which recently increased its capital stock from $25,000 to $50,000. The business is being greatly enlarged and facilities increased to take care of orders.

Garage and Dealers' Field

New Miller Tire Agency—Another distributing station for Miller tires has been selected at 429 N. Meridian street, Indianapolis, Ind.

Kissel Issues New Book—The Kissel Motor Car Co., Hartford, Wis., has issued a new motor truck book containing more than 350 illustrations of various KisselKar truck models in service.

Handling Empire Economizer—The Nat L. McGuire Oil & Supply Co., of St. Louis, Mo., has been appointed agent in the St. Louis district for the Browne-Taylor-Greene Co., Chicago, to handle the Empire gasoline economizer.

Minneapolis Co. Handles Batteries — The Minneapolis Electric Service Company has opened at 10 Tenth street S, representing the Willard storage battery and the Gray & Davis systems. A service station will be maintained. H. S. Greiner from the Willard factory is in charge.

Beating the Tax Law—A number of motorists, who ordered cars some time ago arranged with the dealers throughout the Bay State not to deliver them until after April 1, for on that day the tax assessors make their rounds. In this way they escape the taxation of the cars for 1914, as they feel that the fee they are required to pay is taxation enough.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

ALBANY, N. Y.—Stutz Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: C. E. Graves, M. A. Graves, A. E. Graves.

ALLENTOWN, PA.—Bee Automobile Co.; capital, $10,000; to manufacture motor truck bodies.

BUFFALO, N. Y.—Wilsons Ford Special Corp.; capital, $15,000; to sell automobiles. Incorporators: K. R. Wilson, G. F. Schultz, A. C. McCall.

CHICAGO, ILL.—Cutler-Benton Co.; capital, $10,000; to deal in and exchange automobiles, etc. Incorporators: C. F. Cutler, J. W. Benton, Carl Anis.

CHICAGO, ILL.—Merchants Motor Truck Mfg. Co.; capital, $100,000; to manufacture and deal in motor trucks, etc. Incorporators: William Schulze, J. W. Misek, C. A. Martin.

CHICAGO, ILL.—Standard Cycle-Car Co.; capital, $50,000; to manufacture and deal in cyclecars. Incorporators: O. G. Knecht, H. Hamill, E. Saunders.

CINCINNATI, O.—Megrue M. C. Co.; capital, $25,000; to deal in automobiles. Incorporators: W. H. Megrue and others.

CLEVELAND, O.—Cleveland Auto Fender Co.; capital, $20,000; to manufacture and deal in automobile parts. Incorporators: J. S. Dickle, F. C. Carpenter, William Schoellkopf, F. H. Smith, F. E. Dellenbaugh.

CLEVELAND, O.—Corcoran-Seidel Co.; capital, $25,000; to deal in automobile parts. Incorporators: G. S. Case, F. W. Treadway, W. H. Marlatt, F. B. Bolton, R. G. Morrison.

CINCINNATI, O.—Megrue M. C. Co.; capital, $25,000; to deal in automobiles. Incorporators: W. H. Megrue, W. F. Mothershead, J. A. Durrell, L. K. Siabach, C. H. Barth.

DANVILLE, O.—Danville Auto Supply Co.; capital, $2,000; to deal in automobiles. Incorporators: F. A. Baumgart, E. W. Seanwright, Ira Molt, Pierce Burroughs.

EAST LIVERPOOL, O.—East Liverpool Automobile Club. Incorporators: E. G. Sturgis and others.

GALION, O.—Galion Dynamic Motor Truck Co.; capital, $250,000; to manufacture motor trucks. Incorporators: J. B. Holmes and others.

GREENSBORO, N. C.—Virginia-Carolina Cyclecar Co.; capital, $25,000; to deal in cyclecars. Incorporators: L. G. Klingman, M. W. Bowden, H. Bell.

GULFPORT, MISS.—Sneed Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: R. J. Sneed, S. R. Sneed and others.

HAGERSTOWN, IND.—Teetor-Hartley Motor Co.; capital, $10,000; to manufacture motors. Incorporators: C. N. Teetor, J. Teetor, H. Teetor.

INDIANAPOLIS, IND.—Automatic Gas Motor Co.; capital, $200,000; to manufacture automobiles and accessories. Incorporators: F. B. Whitlock, Harvey Bates, Jr.

JACKSONVILLE, FLA.—Cash Auto Supply Co.; capital, $5000; to deal in automobiles. Incorporators: J. W. Shaid, A. M. Quillan, J. L. Owens.

JERSEY CITY, N. J.—Chillingworth Mfg. Co.; capital, $200,000; to deal in automobiles. Incorporators: L. Muller, H. W. Bissell, J. F. Moore.

KANSAS CITY, MO.—Hudson-Brace Motor Co.; capital, $20,000; to deal in automobiles. Incorporators: W. J. Brace, G. W. Jones, Z. T. Briggs.

LAREDO, TEX.—Laredo Auto Sales Co.; capital, $12,500; to deal in automobiles. Incorporators: J. R. Moore, W. J. Sames, J. E. Applewhite.

MARTINSBURG, W. VA.—Universal Mfg. Co.; capital, $10,000; to manufacture automobiles. Incorporators: C. T. Custer, J. B. Carr, G. W. Dixon and others.

MCKEESPORT, PA.—Jiffy Specialty Co.; capital, $25,000; to manufacture and deal in automobiles and accessories thereto.

NEW ORLEAN, LA.—Auto-Cycle Co.; capital, $100,000; to manufacture autocycles and other motor-driven machines. Incorporators: G. E. Steele, A. B. Lacour, W. J. Horner.

NEW ORLEANS, LA.—Automobile Trading Co.; capital, $50,000; to deal in automobiles. Incorporators: D. O. Myatt, Edw. Thurber, J. L. Rolling, J. R. Perez.

NEW ORLEANS, LA.—Southern Cyclecar Mfg. Co.; capital, $10,000; to manufacture cyclecars. Incorporators: David Fisher, Paul Hecker.

NEW YORK CITY—Engel Crude Oil Engine Co.; capital, $15,000; to deal in crude oil engines. Incorporators: Henry Engel, W. L. Smity, J. M. Hanford.

NEW YORK CITY—Middle States Motor Co.; capital, $5,000; general automobile business. Incorporators: A. C. Beck, C. F. Marion, David Kaess.

NEW YORK CITY—United Motor Owners' Stores; capital, $700,000; to deal in automobiles. Incorporators: Thomas Young, Mars Wheeler, H. J. Ryan.

NEW YORK CITY—Wood Motors Co.; capital, $2,000; to build motors. Incorporators: J. E. Wood, Jr., Frank McKenna, H. R. Partridge.

ROCHESTER, N. Y.—Curtis-Pembroke; capital, $10,000; to manufacture and deal in automobiles and accessories. Incorporators: H. A. Curtis, C. J. Pembroke.

SEATTLE, WASH.—Northwest Motor Co.; capital, $25,000; to deal in automobiles. Incorporators: A. P. Nute, G. H. Tilton, H. E. Mills.

SEATTLE, WASH.—Pacific Cyclecar Co.; capital, $40,000; to deal in cyclecars. Incorporators: F. W. Bishop, T. F. Murphine, Tom Anderson.

ST. LOUIS, MO.—Guenther-Methudy Sales Co.; capital, $10,000; to deal in and purchase automobiles, tires and accessories. Incorporators: C. C. Guenther, E. R. Methudy, E. J. Methudy.

ST. LOUIS, MO.—Mogul Truck Sales Co.; capital, $10,000; to deal in motor trucks. Incorporators: A. C. Hopmann, P. R. Walsh, F. S. Beckwith and others.

TAMPA, FLA.—Hillsborough Automobile Co.; capital, $15,000; to deal in automobiles. Incorporators: John Kallauner, A. J. Pexa, Theodore Kallauner.

TOLEDO, O.—Associated Motor Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: E. F. Miller, Bernard Hubert, H. S. Carn, Edward Elringer, E. J. Schreiber.

TORONTO, ONT.—United Motors Ltd.; capital, $50,000; to manufacture automobiles, motor trucks, etc. Incorporators: J. J. Kenny, L. C. Loomis.

YOUNGSTOWN, O.—Electric Auto Service Co.; to deal in automobiles and accessories. Incorporators: A. F. Clause, D. W. Numan, M. M. Conroy, J. V. Murphy, P. J. James.

GARAGES AND ACCESSORIES

DETROIT, MICH.—Woodward Pump Co.; capital, $50,000; to manufacture and distribute Woodward impulse tire pump. Incorporators: A. Woodward, E. D. Ackerman, C. E. Blasser, C. B. Woodward.

DUNKIRK, N. Y.—Empire Axle Co.; capital, $20,000; to manufacture automobile axles and accessories. Incorporators: O. F. Hakes, Z. R. Hakes, E. De Haven Caldwell.

ELYRIA, O.—Hadaway Taxicab Co.; capital, $2,000; general taxicab business. Incorporators: G. H. Hadaway, Beulah Hadaway, Louis Hadaway, Margaret Hadaway, Anthony Nieding.

HARRISBURG, PA.—Auto Supply Co.; capital, $10,000; to deal in accessories.

HARTFORD, CONN.—City Garage Co.; capital, capital, $10,000; general garage business. Incorporators: R. E. Curtiss, G. W. Dean, J. W. Morrison.

HOBOKEN, N. J.—Hoboken and North Hudson Auto Bus Transportation Co.; capital, $125,000; automobile bus line. Incorporator: William O'Neil.

JERSEY CITY, N. J.—Globe Rubber Tire Co.; capital, $25,000; to manufacture automobile tires. Incorporators: H. J. Joyce, J. P. Hall.

BUFFALO, N. Y.—Motorists' National Supply Corp.; capital, $500; automobile supplies, etc. Incorporators: U. L. Upson, Neenah Bogard, H. C. Tucker.

CHICAGO, ILL.—Consolidated Equipment Co.; capital, $10,000; to deal in accessories. Incorporators: C. E. Bryan, James Barron, O. E. Chapman.

CHICAGO, ILL.—Continental Valve Co.; capital, $2,500; to manufacture valves. Incorporators: J. J. Falvey, A. E. Massey, W. L. Barteau.

CLEVELAND, O.—Buckeye Suspension Co.; capital, $100,000; to manufacture and sell shock absorbers. Incorporators: W. L. David, W. T. Kinder, Ralph Burroughs, T. H. Jones, Gardner Abbott.

CLEVELAND, O.—Zerk Mfg. Co.; capital, $25,000; to manufacture automobile accessories. Incorporators: J. D. Corcoran, G. G. Seidel.

COLUMBUS, O.—Hilane Garage and Machine Co.; general garage business. Incorporators: C. S. Williams, J. C. Langley, F. T. Price, C. M. Carmichael.

CONNERSVILLE, IND.—Steel Hub & Forge Co.; capital, $40,000; to manufacture steel wheel hubs. Incorporators: E. W., W. S. and W. M. Ansted and F. P. Bates.

LOCKPORT, N. Y.—Lockport Automobile Supply Co.; capital, $5,000; to deal in accessories. Incorporators: A. L. Hoag, E. H. Huber, J. R. Jelley.

LOUISVILLE, KY.—McGrath Automatic Brake Co.; capital, $1,000; to manufacture automatic brakes.

LOUISVILLE, KY.—Keeler Battery Co.; capital, $400; to deal in batteries. Incorporators: M. B. O'Sullivan, J. W. Gross, G. G. Keeler.

MANSFIELD, O.—Ohio Tire Co.; capital, $1,000; to manufacture and deal in rubber goods of all kinds. Incorporators: D. Herring, Jacob Reinhart, Norris Kirkpatrick, H. G. Brunner, G. W. Herring.

NEW YORK CITY—A. L. Robertson Motor & Supply Co.; capital, $32,000; general auto bus and garage business. Incorporators: G. E. Smith, Alexander Keoph, W. W. Hoffman.

NEW YORK CITY—Bord's Garage; capital, $10,000; general garage business. Incorporators: J. H. Bord, Otto Zimmerli, R. I. Guendet.

NEW YORK CITY—Eastern Garage Keepers Protective Assn.; capital, $5,000. Incorporators: C. S. Walz, T. C. Walz, J. A. Samborn.

NEW YORK CITY—G. & Z. Garage Co.; capital, $50,000; general garage business. Incorporators: S. S. Zula, Brune Gorschalki, L. E. Swartz.

NEW YORK CITY—Israel & Stanke Auto Renting Co.; capital, $3,000; to rent automobiles. Incorporators: Norman Israel, Blanche Israel, R. A. Stanke.

NEW YORK CITY—Mason Bros.; capital, $10,000; general garage business. Incorporators: E. J. Ellenwood, S. H. Mason, C. S. Mason.

NEW YORK CITY—Washington Heights Taxicab Co.; capital, $1,000; general taxicab business. Incorporators: R. E. Topping, M. L. Topping, George Kirwin.

PHILADELPHIA, PA.—Consumers Tire and Sale Co.; capital, $500,000; to manufacture and sell automobile accessories. Incorporators: F. R. Mansell, G. H. B. Martin, S. C. Seymour.

PITTSBURGH, PA.—Ahlberg Kerosene Carburetor Co.; capital, $300,000; to manufacture kerosene carburetors. Incorporator: Harry Davis.

ROCHESTER, N. Y.—Beechwood Garage; general garage business. Incorporators: Wellington Hiller, L. M. Hiller.

ROCHESTER, N. Y.—Motor Gas Service Station; capital, $1,000; to deal in gasoline, oils, tires, etc. Incorporators: W. D. Elliott, J. K. Elliott, W. R. Gilman.

SEATTLE, WASH.—Davies Tire & Supply Co.; capital, $10,000; accessories and supplies. Incorporators: M. C. Davies, K. M. Davies, F. L. Hicks.

SEATTLE, WASH.—National Tire & Rubber Mfg. Co.; capital, $1,000,000; to manufacture automobile tires. Incorporators: F. P. Marine and others.

SKIATOOK, OKLA.—Skiatook Garage Co.; capital, $4,000; general garage business. Incorporators: J. Schafer, C. L. Wall, L. E. Mason.

SPRINGFIELD, O.—Springfield Mend-A-Leak Co.; capital, $10,000; to manufacture and deal in automobile supplies. Incorporators: R. C. Bancroft, Eugene Garnier, H. L. Slager, Irvin Tennant, H. K. Horn.

ST. LOUIS, MO.—Bart S. Adams Tire Co.; capital, $50,000; to deal in tires. Incorporators: B. S. Adams, W. T. Flynn, H. P. Lindley.

ST. LOUIS, MO.—Wassman & Miller Automobile Co.; capital, $12,000; to repair automobiles.

TROY, N. Y.—Troy Taxicab Corp.; capital, $4,000; general taxicab business. Incorporators: John Burdick, E. L. Snyder, W. H. Tilley.

CHANGES OF NAME AND CAPITAL

CHICAGO, ILL.—Modern Garage and Motor Livery Co.; capital increased from $2,500 to $8,000.

CUYAHOGA FALLS, O.—Falls Tire & Rubber Co.; capital increased from $200,000 to $300,000.

DAYTON, O.—Dayton Rubber Mfg. Co.; capital increased from $150,000 to $1,000,000.

PHILADELPHIA, PA.—Tire Place, Inc.; change of name to Rex Tire Rubber Co.

TOLEDO, O.—American Juvenile Auto Co.; change of name to the National Juvenile Auto Co.

TOLEDO, O.—McNaull Auto Tire Co.; capital increased from $75,000 to $175,000.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Akron, O.	Pilot	Gangl & France
Allerton, Ia.	Oakland	Allerton Telephone Co.
Alpine, Tex.	Hupmobile	Gas Edwards
Arcanum, O.	Chalmers	Arcanum Gar.
Arcanum, O.	Hupmobile	Arcanum Gar.
Augusta, Me.	Haynes	W. S. Ladd
Atlantic, Ia.	Haynes	White Pole Gar. Co.
Baxter, Ia.	Oakland	Noah & McCullough
Binghamton, N. Y.	Pilot	F. M. Cossitt
Bloomfield, Ia.	Haynes	H. A. Wishard
Bradford, Pa.	Pilot	J. Rogerson
Brantford, N. D.	Haynes	O. A. Burdick
Brooklyn, N. Y.	Pilot	J. S. Frazee
Brownsville, Tex.	Hupmobile	J. D. Curtiss
Calumet, Pa.	Pilot	Jacob Kromer
Carlsbad, N. Mex.	Hupmobile	C. W. Tucker
Carrollton, O.	Ford	R. E. Miller M. C. Co.
Carrollton, O.	Hupmobile	Carrollton M. C. Co.
Carrollton, O.	Chevrolet	Carrollton M. C. Co.
Chariton, Ia.	Haynes	McFall M. C. Co.
Collinsville, Ill.	Chevrolet	W. M. Burroughs
Colmer, Pa.	Hupmobile	G. H. Danehower
Columbus, O.	Grant	D. W. Short
Columbus, O.	Pilot	F. E. Jolley
Corpus Christi, Tex.	Pilot	W. A. Wakefield
Cory, Pa.	Pilot	W. E. Marsh
Dallas, Tex.	Haynes	Sacksteder & Potter
Denver, Col.	Pilot	Elmore Auto Co.
De Soto, Mo.	Empire	I. F. Silverstein
Douglas, Ariz.	Hupmobile	W. W. Holmes
Duluth, Minn.	Haynes	M. W. Turner
Easton, Pa.	Pilot	M. H. King
Elyria, O.	Haynes	F. X. Kuchenrither
Fremont, O.	Studebaker	East Side Implement Co.
Ft. Dodge, Ia.	Haynes	David MacMullan
Fulton, Ky.	Oakland	Johnson & Holloway
Glassport, Pa.	Pilot	C. C. Schwerha
Glendale, Cal.	Hupmobile	R. H. Clark
Grand Forks, N. D.	Haynes	Monley & Smith
Harrisonburg, Va.	Haynes	Hammen & Yancey
Hartford, Conn.	Briscoe	City Gar. Co.
Hartford, Conn.	Studebaker	Capitol City Auto Co.

New Agencies Recently Established

PLEASURE VEHICLES

Place	Car	Agent
Ahoskie, N. C.	Hupmobile	E. O. Hines
Akron, S. D.	Henderson	Ernest Ostrom
Almena, Kans.	Hupmobile	R. D. Irwin
Anita, Iowa	Metz	C. O. Harris
Ansley, Neb.	Empire	J. C. Hyatt
Avondale, Pa.	Maxwell	M. F. Morris
Bedford, Va.	Hupmobile	Bedford M. C. Co.
Belleville, Tex.	Maxwell	Palm & Harigel
Boerne, Tex.	Hupmobile	Boerne Auto Sales Co.
Boise, Idaho	Maxwell	Central Auto Co.
Boonville, Mo.	Velie	William Vurtel
Boston, Mass.	Briscoe	Charles M. C. Co.
Boston, Mass.	Empire	F. L. Roberts
Brady Island, Neb.	Maxwell	Lyod Powers
Broken Bow, Neb.	Henderson	Frank Labertew
Brooklyn, N. Y.	Maxwell	I. C. Kirkham
Bucyrus, O.	Hudson	Kroegel & Pursel
Carmel, N. Y.	Maxwell	E. Fowler
Casey, Ill.	Oakland	Partlow & Weaver
Central City, Neb.	Empire	Linderman & Blake
Chadron, Neb.	Cartercar	Rockman & Birdsall
Chadron, Neb.	Car-Nation	E. E. Morey
Champaign, O.	Mitchell	G. E. Thomas Co.
Chester, Pa.	Maxwell	J. R. Helms
Chicago, Ill.	Oakland	P. O. Lind
Cincinnati, O.	Auburn	Haberer & Co.
Clarence, Mo.	Hupmobile	McCarthy Bros.
Clark, S. D.	Hupmobile	Floyd Mahan
Coatesville, Pa.	Maxwell	E. S. Thorne
Colon, Neb.	Buick	H. Nelson
Columbus, Neb.	Empire	Gotterburg Auto Co.
Columbus, O.	Maxwell	Gatewood and Woodruff
Columbus, O.	Saxon	The Broad Oak Auto Co.
Columbus, O.	Vulcan	Miller-Main Garage
Columbus, O.	Westcott	The Brasher Motor Co.
Crestline, O.	Hudson	Kroegel & Pursel
Curtis, Neb.	Car-Nation	R. A. Conover
Darlington, Ind.	Maxwell	Geo. Tribbett
Dedham, Ia.	Abbott-Detroit	J. T. Stangle
Deland, Fla.	Oakland	McGrudder & Bros.
Delaware, O.	Jeffery	C. F. Rodenfels
Delaware, O.	Paige	C. F. Rodenfels
Denver, Col.	Moon	Vreeland Bros.
Dubuque, Ia.	Hupmobile	Schrup M. C. Co.
Elko, Nev.	Maxwell	Steel Garage
El Paso, Ill.	Hupmobile	C. O. Massey
El Paso, Tex.	Maxwell	W. E. Groendycke
Ely, Nev.	Maxwell	Earl Mangum
Equality, Ill.	Maxwell	Weidemann Bros.
Fairfield, Me.	Oakland	J. W. Sawyer
Fair Haven, Vt.	Maxwell	W. I. Smith
Flat River, Mo.	Oakland	J. H. Palmer
Flora, Ind.	Maxwell	Clingenpiel & Brewer
Fort Dodge, Ia.	Hupmobile	Hawkeye M. C. Co.
Ft. Calhoun, Neb.	Car-Nation	Procnew Bros.
Franklin, Pa.	Maxwell	Myers Carriage Co.
Fullerton, Neb.	Buick	Rhoner & Scott
Giltner, Neb.	Maxwell	C. S. Brown
Glade Springs, Va.	Hupmobile	J. R. Hendricks
Grand Island, Neb.	Empire	R. S. Fry
Greenfield, Iowa	Metz	F. P. Huston
Glenwood, Ia.	Henderson	C. E. Harris
Hallsville, O.	Jeffery	J. M. Boecher
Hallsville, O.	Paige	J. M. Boecher
Hardwick, Vt.	Oakland	W. E. Gaither
Harlan, Ia.	Henderson	Harlan Garage
Harper, W. Va.	Oakland	H. H. Harper
Hartington, Neb.	Oakland	F. J. Hirshman
Hartington, Neb.	Henderson	Emil Hoefer
Hickory, N. C.	Hupmobile	Hickory Garage Co.
Hobart, Ind.	Hupmobile	Ed. Batterman
Hooper, Neb.	Buick	Tunberg & Retz
Howard, S. D.	Maxwell	S. T. Radcliff
Howell, Ind.	Maxwell	Howell Auto & Repair Co.
Hubbard, Iowa	Moon	Walter Kellar
Huntsville, Ala.	Oakland	Finney & Davis
Kalispell, Mont.	Maxwell	Colemann & Shacklett
Kasson, Minn.	Maxwell	A. T. Beaver
La Grande, Ore.	Maxwell	L. C. Smith
LaGrange, Ky.	Maxwell	La Grange Auto Co.
Lagrange, Tex.	Maxwell	Lenders & Hausmann
Lamartine, O.	Maxwell	Murdock & Kirby
Lancaster, O.	Hudson	Star M. C. Co.
Lancaster, O.	Paterson	C. H. Cline
Lansdale, Pa.	Maxwell	James Spiers
Lebanon, N. H.	Maxwell	A. L. Flamonden
Leola, S. D.	Maxwell	John Dexter
Lewes, Col.	Maxwell	W. E. Walsh
Lima, O.	Buick	The Lima Buick Co.
Lincoln, Neb.	Jeffery	L. O. Holmes & Co.
Logan, O.	Hudson	Gage Auto Co.
Logan, Iowa	Metz	William Hawkins
Logan, O.	Jeffery	Theodore Johnson
Logan, O.	Mitchell	G. E. Thomas Co.
Logan, O.	Paige	Theodore Johnson
Long Pine, Neb.	Hupmobile	E. C. Engle
Lowell, Mass.	Maxwell	C. W. Armstrong
Lyons, Neb.	Buick	C. W. Swanson
Lyons, Neb.	Buick	R. M. Wellington
Mansfield, O.	Hudson	Herring Buggy Co.
Marysville, Cal.	Maxwell	Henry Heier
Marysville, O.	Hudson	Marysville C. C. Co.
Marysville, O.	Oakland	H. I. Huffman & Sons
McAlster, Okla.	Maxwell	J. Basale
McClellan, Iowa	Empire	O. K. Whitson
Medaryville, Ind.	Oakland	C. W. Holl & Co.
Mineral Point, Wis.	Maxwell	Star Auto Co.
Minneapolis, Minn.	Saxon	Northwestern Auto Co.
Minneapolis, Minn.	Wahl	Martin Motor Sales Co.
Missouri Valley, Ia.	Buick	Mason & Seabery
Mosheim, Tenn.	Maxwell	W. H. Reaves
Mt. Carmel, Ill.	Maxwell	B. H. Kemp
Mt. Sterling, O.	Paterson	Erskine & Corkwell
Nashville, Ill.	Velie	A. Davenport
New Boston, N. H.	Maxwell	G. D. Marden
Newark, O.	Grant	Murray Connolly
North Liberty, Ind.	Maxwell	I. A. Finch
Oconto, Wis.	Maxwell	Peter De Cloux
O'Fallon, Mo.	Oakland	Salfin Bros.
Oil City, Pa.	Franklin	Phinney & Sloan
O'Neill, Neb.	Buick	Jordon & Warner
Orlando, Fla.	Hupmobile	F. G. Rush
Orlando, Cal.	Oakland	J. B. McGroudder & Bros.
Ord, Neb.	Metz	E. H. Capron
Palestine, Tex.	Maxwell	J. D. Woods
Paoli, Ind.	Maxwell	Arthur Mathews
Peekskill, N. Y.	Maxwell	W. H. Ash
Penn Yan, N. Y.	Oakland	E. L. Geer
Philadelphia, Pa.	Grant	H. H. Bruah
Platte, S. D.	Hupmobile	R. M. Girton
Poplar Bluff, Mo.	Richmond	Reliable Motor Co.
Poultney, Vt.	Maxwell	Poultney Auto & Machine Co.
Prairie Du Chien, Wis.	Maxwell	Keller & Harris Auto Co.
Princeton, W. Va.	Maxwell	J. M. Hines
Princeton, Ill.	Oakland	Alpaugh Bros.
Princeville, Ill.	Maxwell	Sloan & Williams
Pueblo, Col.	Maxwell	Western Motor Car Co.
Radnor, O.	Jeffery	Frank Coonfare
Radnor, O.	Paige	Frank Coonfare
Ravenswood, W. Va.	Maxwell	E. E. McKinley
Reading, Pa.	Franklin	J. M. Kalbach Co.
Reading, Pa.	Maxwell	W. D. Degler & Co.
Redfield, Ia.	Hupmobile	A. E. Smith
Reliance, S. D.	Car-Nation	A. R. McMullen
Republican City, Neb.	Maxwell	J. J. Runck
Richwood, O.	Paige	R. D. Roberts
Richwood, O.	Jeffery	R. D. Roberts
Rochester, Minn.	Hupmobile	T. E. Barber
Royal, Neb.	Metz	A. B. Clarke
Salem, N. J.	Maxwell	New Jersey Motor Co.
Santa Monica, Cal.	Hupmobile	R. M. Kricker
Sauk Center, Minn.	Hupmobile	Smith Bros.
Schuyler, Neb.	Empire	Douglas Groteleschen
Scio, O.	Maxwell	M. M. Webster
Shenandoah, Iowa	Maxwell	C. A. Piper
Silver City, Neb.	Metz	C. W. Sawyer
Silver Creek, Neb.	Henderson	W. J. O'Callahan
Silver Creek, Neb.	Car-Nation	W. H. Calaghan
South Bend, Ind.	Hupmobile	R. J. Martin
St. Elmo, Ill.	Hupmobile	Decker-Kelly Garage
Sterling, O.	Oakland	Roy Baxter
St. Louis, Mo.	Havers	Brinkman Motor Co.
St. Louis, Mo.	Haynes	Auto Clearing House
St. Paris, O.	Paterson	C. O. Tomlin
St. Paul, Minn.	Dayton	Dayton Cyclecar Sales Co.
Shreveport, La.	Franklin	Shreveport Auto Sales Co.
Thomasville, Ga.	Maxwell	W. A. Palin
Tiffin, O.	Chevrolet	C. L. Fifer
Tiffin, O.	Paterson	G. W. Corthell
Vancouver, Wash.	Hupmobile	Sparks Bros.
Waverly, Tenn.	Maxwell	Hager Motor Car Co.
West Alexandria, O.	Oakland	J. L. Rhodes
Wichita Falls, Tex.	Maxwell	Imperial Motor Sales Co.
Woodard, N. C.	Hupmobile	E. O. Hines
Washington, O.	Paige	Moore & Jamison

COMMERCIAL VEHICLES

Kansas City, Mo.	Buick	J. E. Pixlee
Boston, Mass.	Little Giant	Chicago Pneumatic Co.
Cleveland, O.	Commerce	Kellogg & Pettet
Columbus, O.	Little Giant	Gaither Automobile Co.

ELECTRIC VEHICLES

Philadelphia, Pa.	Argo	R. H. Bobb
St. Louis, Mo.	Standard	Standard Elec. Sales Co.

CYCLECARS

Bakersfield, Cal.	Imp	Tennessee Lawrence
Bloomfield, N. J.	Imp	P. C. Batzle
Eureka, Cal.	Imp	G. K. Coleman
Hannibal, Mo.	Imp	Hannibal Auto Co.
Oakland, Cal.	Imp	E. L. James
San Diego, Cal.	Imp	Tanner & Watson
San Jose, Cal.	Imp	San Jose Vulcanizing Works
Stockton, Cal.	Imp	Branches, Inc.

Accessories for the Automobilist

HERMANN Cyclecar Motor—A four-cylinder motor, with 2.25-inch bore and 4-inch stroke, that sells for $45 without magneto or carbureter in lots of 1,000, and which sells in sample lots equipped with magneto and carbureter for $100 is manufactured by the Hermann Engineering Co., Detroit, Mich. The motor is rated at 10 to 16 horsepower. It is shown in Fig. 1.

This motor has an L-head, block-cast cylinder construction, with inclosed valves and a detachable cylinder head. It is designed for thermo-syphon cooling and the lubrication is by splash. The weight is normally 170 pounds, but by using aluminum, at an increased cost, the weight can be reduced to 155 pounds.

The valves and carbureter are on the left, and the magneto is situated on the right. The manifolds are shaped so that the valves are easily accessible for adjustment. The removable cylinder head permits the carbon to be scraped out easily. The main and connecting-rod bearings are accessible from beneath, the crankcase being split horizontally and the lower half being removable.

The crankshaft is a single-piece drop forging heat treated and ground, and the camshaft is a special bone-hardened carbon steel ground to size. The connecting rods are drop forged, and the main and crank-pin bearings are made of babbitt. The valves have cast-iron heads and adjustable tappets. The push rods and wrist-pins are also hardened and ground. The timing gears are made of cast iron and steel and have extra wide faces.

Bock Roller Bearings—An interesting departure in roller bearing design is exemplified in the Bock, shown in Fig. 2, which has special provision against end thrust. Instead of using plain conical rollers, rollers are employed that have a flange on their large ends and it is these flanges that take the thrust. The rollers are carried in a cage which holds them in position and keeps them spaced.

Virtue Foot Pump—A foot pump, of new design, has been added to the line of the Brown Co., Syracuse, N. Y. It is a double-acting type in which air is compressed on the downstroke, and on the upstroke the air is forced into the tire. No steel balls or springs are used in its construction. The tubing used on the outer cylinder is extra thick, thus obviating the possibility of denting.

The pump mechanism can be taken apart in a few seconds and the leather pump washers can then be renewed in a few moments. The price is $3.

Master Garage Pumps—After many months of tests the Hartford Machine Screw Co., Hartford, Conn., has put three models of garage pumps on the market, two of which are illustrated in Fig. 3.

The salient feature of these pumps is that they are constructed entirely of metal, no leather or rubber being used. All three models are two-cylinder, air-cooled designs and are driven by electric motors. The two larger models are portable while the smallest is not.

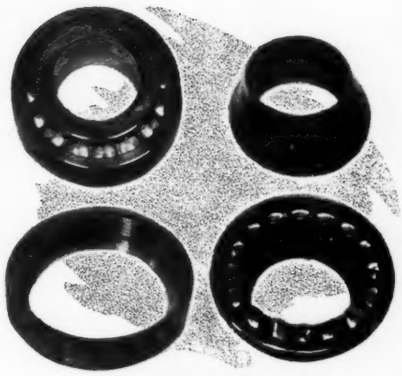

Fig. 2—Bock roller bearing

The largest model has a storage tank of 2300 cubic inches capacity, which is sufficient to inflate four 37 by 5 inch tires to 90 pounds pressure.

The pistons are made of special steel carefully hardened and ground to size; the cylinders are also ground with the result that no rings are required.

Patton Safety Starter Crank—To prevent accidents when cranking the automobile, due to kick backs, the Stewart Auto Accessories Co., Chicago, Ill., is offering the Patton safety crank at $4. It resembles the ordinary crank, outwardly, and can be attached in a few minutes. It contains no springs, ratchets, pawls or gears and does not require adjustment.

Shaler Garage Steam Vulcanizer—The vulcanizer made by the C. A. Shaler Co., Waupun, Wis., shows several new and interesting features. Two moulds or heaters apply heat to the outside and inside of the tire at the same time while pressure is secured by wrapping tape around the casing, thus binding it upon the inside mold. It is said that this permits a very economical and satisfactory repair by building up a reinforcement of fabric on the inside of the tire and simply filling the hole through the tire with raw rubber. When the heat is applied the reinforcement is welded to the tire so that it cannot come loose.

Heat is supplied to the boiler by a large double gas or gasoline burner, the boiler consisting of a coil of copper tubing so that steam is raised in about 20 minutes. The temperature is controlled by a thermostat which operates a damper placed above the boiler in such a manner as to automatically hold the steam at the right temperature by maintaining the pressure at the value corresponding to this temperature.

Speer Carbon Brushes—The Speer Carbon Co., St. Marys, Pa., is manufacturing composition metallic-graphite brushes for use on starting motors and lighting generators. It is said that these brushes have a proper combination of low-resistance metal and a lubricating element homogeneously blended and strong enough to withstand the wear and tear of use. The advantage claimed is that they give the low resistance and high current density of a metal brush, but unlike the latter are self-lubricating and therefore will not wear the commutator.

Apco Ford Dash Gasoline Gauge—A gasoline gauge that is designed for installation on the dash of the Ford car and which shows the amount of fuel in the tank on a circular dial, the same as a pressure gauge indicates pressure, is made by the John V. Wilson Co., 220 Pleasant street, Boston, Mass. Installation is simple, being accomplished by unscrewing the petcock at the bottom of the gasoline tank and putting a special fitting in its place, to which the

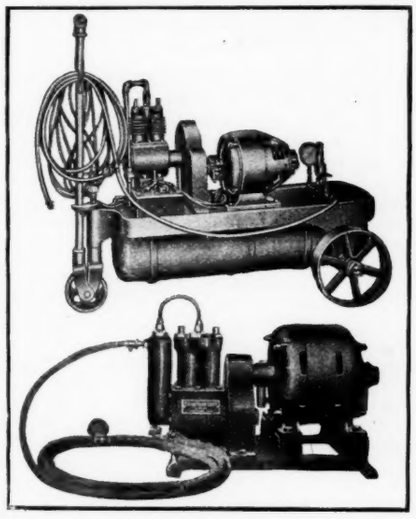

Fig. 3—Two models of master garage pumps

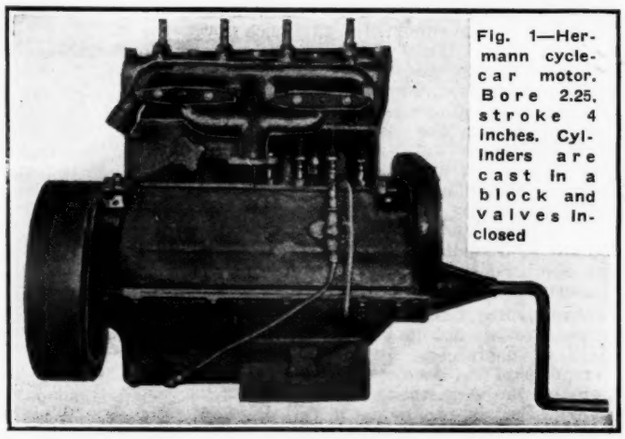

Fig. 1—Hermann cyclecar motor. Bore 2.25, stroke 4 inches. Cylinders are cast in a block and valves inclosed

Fig. 4—Two views of Waltham automobile clock. Method of winding is shown at the right

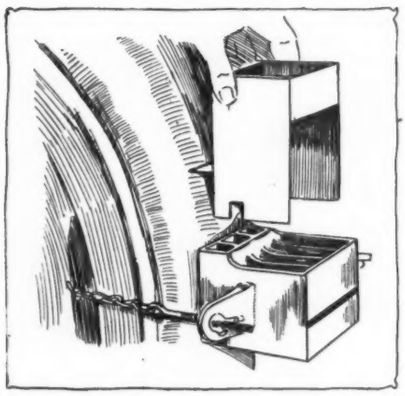

Fig. 5—Positive portable steam vulcanizer

pipe running to the gauge on the dash is connected. The price is $6.

Waltham Automobile Timepieces—One of the most popular models of dash clocks made by the Waltham Watch Co., Waltham, Mass., is the model C, Fig. 4. This model is sunk into the dash, as shown at the left. All attachments are concealed and the timepiece is an integral part of the car.

The illustration at the right shows it extended for winding. A turn of the wrist releases a spring which projects the clock from its niche in the dash, permitting the key to be raised for winding. After winding, the key is turned back, and the timepiece is locked in place by depressing it and giving it a turn in the opposite direction. The winding key also sets the timepiece and an indicator on the dial shows red when it needs rewinding, which is only once in 8 days.

Positive Portable Steam Vulcanizer—A reduction of $1.50 has been made in the portable vulcanizer made by the Positive Supply Co., Davenport, Ia., the price now being $3.50. This includes scissors, measure, repair gum and tube stock.

The vulcanizer, Fig. 5, is very simple in its construction and operation. It has two chambers, the one adjacent to the tire containing water and the other one the fuel which may be gasoline, alcohol or kerosene. The combustion of the fuel boils the water and thus vulcanizes the tire or tube. It will mend holes up to 2½ inches in diameter, in tubes or castings, in one 20-minute setting, while larger holes require more than one setting.

Armstrong Cork Products—With the growth of the automobile industry a new field of usefulness for cork and cork composition has developed. To meet this demand the Armstrong Cork Co., Pittsburgh, Pa., is producing a full line of cork parts that are required on the automobile. These include floats for carbureters, gaskets for oil pans, gearset and differential covers, washers to prevent rattle and the entrance of dust, pulley-rim covers, clutch inserts, plugs of natural cork for wire conduits to prevent the entrance of dust and grease, pads for mounting tool boxes, gas tanks, etc., and linoleum and cork carpet for covering floors and running boards, taking the place of rubber or metal coverings.

The chief advantage of cork for gaskets is that it will not deteriorate in the presence of oil and it is so permanently elastic that the necessity of machining pressed steel and other surfaces in order to obtain tight joints is eliminated.

Apex Hand Pump—A three-cylinder hand pump which will inflate a tire in 30 seconds, it is said, has been brought out by the Buffalo Auto Accessory Co., Buffalo, N. Y. The length of the pump is 22 inches and the cylinders are made of seamless brass tubing. The rods are of steel and the pistons of leather. The price is $6.

Glasbrite—The Benjamin P. Forbes Co., Cleveland, O., is making a chemical glass cleaner that is said to be of great aid in keeping the glass on the car clean. It is an impalpable powder free from acid, grit or other harmful substances and will impart a high polish to the windshield, headlight reflectors and other glass parts that require cleaning. It is put up in 1-5-pound tins. A similar material in the form of a paste is also made.

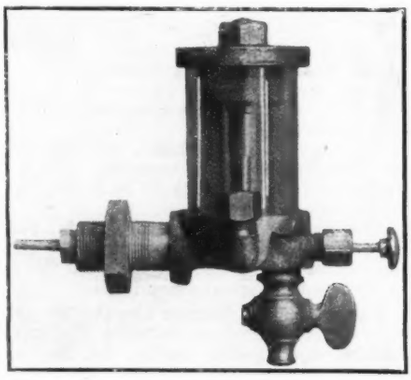

Fig. 6—Wackenhuth glass-barrel strainer

Meiner's Emergency Conveyor—When the wheel or axle breaks, the automobile can be towed in with little difficulty by the use of a device made by R. F. Meiner, 1779 Broadway, New York City. It consists of an auxiliary wheel made of steel and 12 inches in diameter, which is supported by a forked member, the upper end of which is formed into a yoke, each side of this yoke clamping to the car spring. It is furnished with brackets for all cars and can be attached in 4 minutes. It lists at $25.

Glass Barrel Strainer—A new type of fuel strainer and primer, Fig. 6, has been introduced by the F. Wackenhuth Co., 93 Lafayette street, Newark, N. J. It is featured by a glass barrel which permits the operation of the strainer, and when it needs cleaning, to be told at a glance. When used with a pressure system it can be installed on the dash, and thus enables the operator to watch the operation of his fuel system the same as the lubricating system. The inlet connection is shown in the center, while the outlet is at the back. The petcock is for draining out the sediment that collects. The gasoline flows from the inlet connection up through the standpipe that extends into the settling chamber, where water and heavy dirt are left behind, lighter particles of foreign matter are caught by the strainer at the top. After the fuel passes through the strainer it flows through a hole in the central tube, down and out to the carbureter.

To prime the motor the handle at the right is reciprocated, introducing gasoline into the manifold through the small tube that extends from the left. The price is $3.50.

Dumaco Body Finish—A waterproof polish and cleaner especially adapted to motor car bodies is marketed by the J. E. Dunlin Mfg. Co., Springfield, Mo. The polish prevents the adhesion of mud and dirt and gives the body a pleasing gloss.

Catherman Cyclecar Garages—To meet the demand of cyclecar owners J. A. Catherman, Beaver Springs, Pa., has brought out a garage of the portable type, Fig. 7, that is suitable for cyclecars. This garage is 6 by 6 by 12 feet and is built in sections so that it can be put up or taken down in 15 minutes.

In addition a full line of garages for larger cars is manufactured, the sizes varying from 10 by 16 to 16 by 20 feet and the corresponding prices from $175 to $225. One of these is shown in Fig. 8.

Apco Ford Windshield Ventilators—Ventilation can be secured by the use of two brackets which are attached to the dash and which support the windshield, and by means of which it can be shifted to the rear about 2 inches. This is enough to give satisfactory ventilation on the hottest day in summer, a strong draft of air being forced through the opening between the windshield and the dash. The brackets can be put in place without any drilling and are so designed that the windshield will not rattle. They are made from bronze, enamel, black, and are sold for $2.50 by the John V. Wilson Co., Boston, Mass.

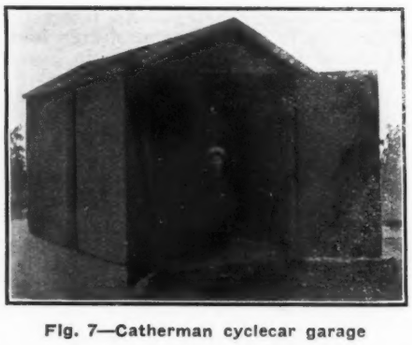

Fig. 7—Catherman cyclecar garage

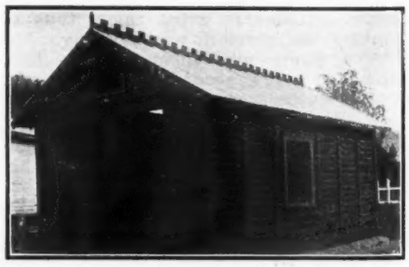

Fig. 8—Catherman large car garage